



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

**Division of Facilities Construction and Management**

**DFCM**

# DESIGN MANUAL

**May 25, 2005**

Includes:      Programming Standards  
                 Design Process  
                 Design Requirements

# DFCM DESIGN MANUAL

May 25, 2005

The DFCM Design Manual is divided into three separate yet dependent sections. The sections are “Programming Standards”, “Design Process” and “Design Requirements”. Each section provides information and direction for developing programs and designs to meet the DFCM expectations.

The “**Programming Standards**” section lists the basic requirements for a complete and final program for a new building. It does not give step by step directions or process requirements for producing a final program. The selected programming firm, the using agency and DFCM are expected to determine and process what best suits the project and the participants.

The “**Design Process**” section gives direction on what is expected as an outcome of the design process. DFCM intends to select only qualified exceptional design teams. DFCM expects an effort that is not driven by minimal requirements but by good design practice. As such this is meant to be a guide and not a rigid procedural manual. This section covers issues such as quality requirements, code requirements, design process submittals and budget control.

The “**Design Requirements**” section is just that, a list of requirements that apply to DFCM projects. The basic levels of requirements are those imposed by codes. The next level of requirements are those that, due to experience, DFCM has found need to exceed code or are best design practice for normal state buildings. The next levels of requirements are those that meet individual agency needs and standards. The “Design Requirements” section encompass these requirements.



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

**Division of Facilities Construction and Management**

**DFCM**

# **PROGRAMMING STANDARDS**

May 25, 2005

## **PROGRAMMING STANDARDS PURPOSE**

The purpose of this standard is to set forth the requirements for facility programming services for DFCM.

Programming services shall define and provide a cost estimate for the project within the constraints of the “Agreement between DFCM and the Programming Consultant.” The finished program must communicate the needs of the Users into a workable facility description.

Avoid programming requirements that may conflict with future requirements of the Design Process or the Design Requirements.

# PROGRAMMING STANDARDS

## TABLE OF CONTENTS

Programming Standards Purpose  
Table of Contents

### **1.0 General**

#### 1.1 General

- A. Purpose and Scope

### **2.0 Facility Program**

#### 2.1 General

#### 2.2 The Completed Program Shall Include.

- A. Signature Page
- B. Executive Summary
- C. Programming procedure
- D. Space use program
- E. Detailed space use descriptions
- F. Detailed room descriptions
- G. Building systems performance criteria
- H. Cost Analysis

#### 2.3 Introductory Information

- A. Title Sheet
- B. Signature Sheet

#### 2.4 Executive Summary

- A. Purpose
- B. Organization

#### 2.5 Site analysis

- A. Purpose
- B. Physical Characteristics
- C. Orientation
- D. Site Functions and Relationships
- E. Code

#### 2.6 Building Requirements

- A. Purpose

#### 2.7 Individual Space Outlines

- A. Purpose
- B. Spaces
- C. Detached Analysis of Each Space
- D. Area Space summary Sheet

#### 2.8 Cost Model

# PROGRAMMING STANDARDS

## 1.0 GENERAL

### 1.1 General

- A. Purpose and Scope.
  - 1. Programs shall comply with the Design Process, the Design Requirements, and the Programming Standards.
  - 2. The intent of the Program Standards is to provide clear criteria which the Facility Program must achieve for the project to be considered successful.
    - a. The DFCM's Designated Representative may exclude portions of the Program Standards for projects where the scope of the programming needs are less, such as for feasibility studies.
  - 3. The specific performance requirements are given as minimum criteria to allow the Programming Consultant flexibility. If the needs of the Project are less stringent than the minimums identified in the Program Standards the approval of the DFCM's Designated Representative is required.

## 2.0 FACILITY PROGRAM

**2.1 General.** A "Program" is defined as a written statement setting forth design objectives, constraints, and criteria for a project, including space requirements and relationships, flexibility and expandability, special equipment and systems, and site requirements.

**2.2 The completed program shall include, but is not limited to the following:**

- A. Signature Page
- B. Executive Summary
  - 1. Programmatic analysis and conclusions.
  - 2. Programming references and site information.
  - 3. Programming team.
  - 4. Building programming committee.
  - 5. Area comparisons.
  - 6. Program spaces summary.

- C. Programming procedure
- D. Space use program
  - 1. Site considerations
  - 2. Site diagrams
  - 3. Efficiency analysis
  - 4. Stacking diagram
  - 5. Constructability
  - 6. General adjacency description
  - 7. General adjacency diagram
  - 8. Adjacency matrix
  - 9. Pre-schematic finish schedule
- E. Detailed space use descriptions
  - 1. Space adjacency descriptions
  - 2. Space adjacency diagrams
  - 3. Program spaces summary
- F. Detailed room descriptions
- G. Building systems performance criteria
  - 1. Code requirements
  - 2. Individual space requirements
  - 3. Structural overview
  - 4. Mechanical systems
    - a. Codes
    - b. Air handling
    - c. Controls
    - d. Fire sprinkling
    - e. Plumbing
  - 5. Site utility infrastructure
  - 6. Electrical systems
    - a. Codes
    - b. Lighting
    - c. Distribution
    - d. Fire and safety
    - e. Communications

H. Cost Analysis

1. Project estimate
2. Project schedule
3. Construction cost estimate description
  - a. Detailed estimate

**2.3 Introductory Information**

A. Title Sheet

1. Project Name
2. Name of the agency or institution
3. DFCM Project Number
4. Date of Publication
5. Name, address, and telephone number of the firm preparing program.

B. Signature Sheet

1. Appropriate signatures should include the following:
  - a. Representatives of agency persons involved in the preparation of the program.
  - b. Other persons reviewing the program as required by the agency.
  - c. Director of DFCM.
  - d. DFCM's Designated Representative.
2. Acknowledgments
  - a. Acknowledgments Statement.
  - b. List names and titles of individual who were involved in the process.
3. Index
  - a. Provide a complete index with page numbers.
  - b. Index of charts, maps and illustrations.

**2.4 Executive Summary**

- A. Purpose of the executive summary is to summarize essential information about the program for convenient reference. The summary should present the highlights and essential data of the program findings for the purpose of informing the Division of Facilities Construction and Management, the Building Board, the Governor, and the Legislature as to the most important aspects of the program.



**B. Organization**

1. **Project Justification:** Present a brief summary of functions and a statement of need as discussed in the building analysis section.
2. **Space Requirements Summary (1 or 2 pages):** Present a summary of spaces which includes both net and gross square footages with individual spaces being grouped in logical divisions. Identify which spaces are assigned usable spaces and which are auxiliary or support spaces.
3. **Cost Model: Facility Program Cost model** requires a mixture of costs per functional space (such as office, classroom, etc.), cost per cubic foot, cost per square foot, and cost per linear foot for items where the cost is not easily forecast by a cost per square foot model such as site utilities. In some cases, design options shall be selected to reduce the range of costs for the program. These design options shall be defined as assumptions. All cost information shall be summarized into a cost model with line item totals for demolition, civil/site work, structural, electrical, mechanical, landscaping, and architectural systems.
4. **Project Schedule:** The executive summary is to include a brief summary of the estimated time line of the entire project, including design, construction, and date of occupancy.

**2.5 Site Analysis**

**A. The purpose of this section is to identify the effects of the site on the program, project cost and schedule.**

1. The main questions to be answered in this section are:
  - a. What is on the site now?
  - b. How will the site affect the project?
2. The main areas of concern:
  - a. Physical characteristics.
  - b. Orientation/views/prevaling conditions.
  - c. Site functions and relationships.
  - d. Site access and preparation issues.
  - e. Codes and easement restrictions.
  - f. Geotechnical considerations and impacts.

**B. Physical Characteristics:** Collect, organize and present facts about the site which are pertinent to the development of the project. This process involves two levels of investigation:

1. Visual Survey and Investigation: This first level of fact finding is performed by the programming team and contains the following:
  - a. Visually document the site with air and land based photographs keyed to a site plan and verbal descriptions as needed.
  - b. Present features, irregularities, unique qualities.
  - c. Site description.
  - d. Neighboring buildings or features.
  - e. Utility surveys and documentation.
2. Independent Testing and Surveying: DFCM shall be responsible for testing and surveying. DFCM shall contract for environmental assessments, geologic survey, soil investigation, surface contours and property description survey, utilities surveys, title search, and archeological surveys. Programming Consultant is responsible to interpret the results and present the impact to the project. Detailed information from the following testing and surveys shall be completed and included in the Facility Program appendix.
  - a. Hazardous Materials Assessment: If contaminants are present, DFCM's Designated Representative shall arrange for the assessment and identify the costs for removal.
  - b. Geologic Survey: Identify the seismic characteristics of the site, fault lines, and the general geologic structure.
  - c. Soils Investigation: Identify the structure of the soil. Test soil for bearing capacity, collapsibility, and other characteristics. Locate the water table. Provide a topsoil mechanical/nutrient analysis. Advise concerning needs for special footings and foundations.
  - d. Surface Contours and Property Description Survey: Identify surface contours and all visible features. Locate the property line.
  - e. Utilities Surveys: This is usually done in conjunction with the surface contours and property description survey. Identify separate utility lines and related information such as size, material, depth, etc. Document the available documents for utilities. Test water pressure for fire fighting requirements.
  - f. Title Search: Determine ownership, easements, rights of way or other information associated with the project.
  - g. Archeological Surveys: Some sites shall require archeological surveys prior to design and construction. These surveys shall be completed according to the State Archeologist prior to completion of the program document.

- h. Indicate the distance to the nearest known seismic fault.
- 3. Test and survey analysis by Programming Consultant.
  - a. Utility feasibility studies to determine capacity and location for Civil Systems, Central Plant Mechanical Systems, Electrical Systems, and Communications Systems.
  - b. Review the Independent Testing and Surveying results.
  - c. Include a statement of the impact the results may have on the project and project schedule.
  - d. Analyze the cost impact of the results and include these costs in the cost model.
  - e. Prepare a list of drawings, specifications, studies, etc., which are available for the site or facility. Analyze the accuracy and deficiencies of the available documents.

C. Orientation

- 1. Present the orientation of the site:
  - a. Solar exposure
  - b. View into the site and out of the site
  - c. Climate
  - d. Prevailing winds and wind exposure

D. Site Functions and Relationships

- 1. Circulation of vehicles, pedestrians, and service needs.
  - a. Identify service to the facility including dumpster location, screened utility areas, and any special access areas needed.
- 2. Concepts of how the following types of circulation will work: Public, staff, pedestrian, student, vehicles, parking requirements, public transportation, service, ADA access, security site requirements. Use diagrams to illustrate access and circulation concepts.
  - a. Define areas of limited access.
  - b. Parking spaces required for Staff, visitors, and motor pool including any secured parking needs.

E. Code

1. Provide site consideration requirements.
  - a. How will the fire lane access requirements affect this project?
  - b. Identify by diagram access lane requirements and its effect on cost.
2. Building/occupancy types and the cost impact.
3. City and County zoning ordinances.
  - a. While local zoning approval is not required for State projects, this information is critical to enable the project to be a good neighbor to the intent of the local ordinances.
4. Fire Marshall considerations.

## 2.6 Building Requirements

- A. The purpose of this section is to present the requirements for the following elements:
1. Identification: The purpose of this section is to identify the essential nature of this project. What is the mission of this project? What are the departments and divisions that are to be housed here? What is the major grouping of spaces? What are the major elements of this design project?
  2. Justification: The purpose of this section is to demonstrate why the project is needed at this time, at this location, and with these occupants. DFCM and the Agency shall assist in the preparation of this portion of the Facility Program document. Some areas of concern may be:
    - a. Why is the facility needed?
    - b. Why are the listed departments housed together in this facility?
    - c. What will this project contribute to the mission of the agency?
  3. History and Growth: The purpose of this section is to present this project in terms of time. The needs of the user are constantly changing. Present the following information:
    - a. History of growth of the user group.
    - b. Agency's present location and number of square feet presently used.
    - c. Anticipated growth: Document the factors leading to growth projection.
    - d. What are the needs of the user group for changeability, adaptability, flexibility, expansion?

4. Master Plan Reconciliation: If this project is required to work within the context of a campus or organization master plan, indicate ways in which the project aligns with the intent of the master plan. Indicate ways in which the project does not meet the requirements of the master plan.
5. Function: The purpose of this section is to analyze the functions to be performed in this facility. The information of the individual space requirements is essential to this section and will be used extensively. The key words are people, activities and their relationships to the project design concept.
  - a. People
    - (1) Identify the people involved in this facility. Examples: Staff, students, public patients, customers, Agency.
    - (2) Number of people.
    - (3) Categories of people in the facility.
    - (4) Present the organization of the staff in the facility.
    - (5) Present user characteristics.
    - (6) It is pertinent to consider patterns of behavior, unique needs, and special needs that will impact the facility.
  - b. Activity
    - (1) Group types of activities in appropriate and applicable categories such as: departments, service, public access, private, noisy, quiet, clean, dirty, secure, controlled, dark, etc.
  - c. Relationships: The purpose of this section is to study relationships in the project.
    - (1) Study adjacencies, and present adjacency requirements.
    - (2) Positive essential relationships.
    - (3) Negative relationships. What spaces should be kept apart or in some way separated?
    - (4) Use graphical diagrams such as bubble diagrams and stacking diagrams to define the needs of relationships.
    - (5) Evaluate the scale of individual spaces and evaluate ways they could be assembled to meet relationship needs.
    - (6) Identify zones of compatibility and shared space options.
    - (7) Identify concepts pertinent to the project, for example: Hierarchy of functions, service grouping, activity grouping, people grouping, home base, accessibility, separated flow, sequential flow, flexibility, adaptability.

6. Form: The purpose of this section is to present requirements that will influence the physical shape of the project outside of function. The question here is: “What will be the massing characteristics of the facility on the site?” Several factors are:
- a. Quality and Image: Describe the quality and durability level expected. Describe how the new building match, or contrast, with the existing materials on neighboring facilities. Communicate the goals that are appropriate to the funding and use.
  - b. Building Space Utilization Efficiency: Use this section to analyze the net-to-gross ratio. Identify and justify what ratios should be used. For our purposes net square feet means all space that is of the essence to the project. Refer to Utah Space Standards for applicable requirements. Areas not included in the net are:
    - (1) Restrooms
    - (2) Circulation
    - (3) Structure and partitions
    - (4) Columns
    - (5) Unassigned storage/maintenance areas
    - (6) Stairs
    - (7) Elevators
    - (8) Mechanical, electrical, and communication shafts and spaces.
  - c. Guidance: Programming Consultant shall recommend the net-to-gross factor most appropriate to this particular project and site.
  - d. Code Impact: Include here a Codes analysis. Before the final program is issued, review the analysis with the Building Official.
  - e. Structural Requirements: Include here an analysis of the structural requirements.
  - f. Mechanical Requirements: Include here an analysis of the mechanical requirements.
  - g. Electrical Requirements: Include here an analysis of the electrical requirements.
  - h. Communication Requirements: Include here an analysis of the communication requirements.
  - i. Energy Efficiency Requirements: Include here an analysis of the energy efficiency requirements.

- j. Hazardous Materials: Identify the project considerations related to asbestos or other hazardous materials.
- k. Existing Facilities: (If Required)
  - (1) Identify the problems related to the existing facility.
  - (2) Acquire available documentation for the facility and report any deficiencies in existing documentation.
  - (3) Present the existing facility configuration.
  - (4) Study and show ways the program requirements can work within the existing spaces.

## **2.7 Individual Space Outlines**

- A. The purpose of this section is to present the individual space requirements. The information required in this section is detailed and specific.
- B. Spaces: Consider these spaces as areas within facility with certain characteristics. Do not limit definition of spaces to rooms.
- C. Detached Analysis of Each Space:
  - 1. Function and activities performed in the space.
  - 2. Desirable space dimensions.
  - 3. Desirable sample floor plan: show critical dimensions such as required equipment clearances.
  - 4. Number of assigned occupants in the space and hours of use.
  - 5. Number of occasional visitors to the space.
  - 6. Reference to the current Utah Space Standards, if applicable.
  - 7. Type of light that is required including whether natural or artificial light and lighting levels required.
  - 8. Windows required.
  - 9. Views required.
  - 10. Acoustic requirements for privacy, noise, and intelligibility.
  - 11. Security requirements.
  - 12. Temperature, ventilation, and humidity requirements.
  - 13. Finish materials requirements.
  - 14. Electrical requirements.
  - 15. Communications outlet requirements.
  - 16. Audio-visual requirements.
  - 17. Required ceiling height.
  - 18. Furnishings and equipment requirements: Indicate whether the furnishings are new or existing to be relocated.

D. Area Space Summary Sheet.

1. Identify the Total of net and gross square feet needed.
2. Identify the net to gross factor.
  - a. Identify source of the net-to-gross factor.

**2.8 Cost Model.** The purpose of this section is to present the Preliminary Facility Program Cost Model.

A. The cost model must be summarized into the following categories:

1. Civil/Site
2. Landscape
3. Structural
4. Architectural
  - a. Building skin
  - b. Interior finish
5. Mechanical
6. Electrical
7. General Conditions
8. Overhead and profit.

B. Find and present the actual costs of two projects of similar size, use, and quality that have completed construction in the past two years as a comparison to the proposed project.





STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

**Division of Facilities Construction and Management**

**DFCM**

# DESIGN PROCESS

May 25, 2005

## **PREFACE**

In order for the Division of Facilities Construction and Management (DFCM) to be one of the nation's premier facility construction and maintenance managers, it is essential that we consistently provide the best value in the facilities that serve the citizens of the State of Utah.

# DESIGN PROCESS

## TABLE OF CONTENTS

Preface  
Table of Contents

### **1.0 General**

- 1.1 General
- 1.2 Related Documents
- 1.3 Communication
- 1.4 Conflicts, Exclusions, Omissions, and Revisions
  - A. Conflicts
  - B. Exclusions

### **2.0 Project Specific Requirements**

- 2.1 Image to Public and Occupants
  - A. General
  - B. Appearance and Image of the Facility
- 2.2 Budget
- 2.3 Schedule
- 2.4 Agency Related Requirements

### **3.0 Regulatory, Standards, and DFCM Requirements**

- 3.1 General

### **4.0 Project Process**

- 4.1 General
  - A. Definition
  - B. Meeting Requirements
  - C. Documentation Requirements
  - D. Verification
  - E. Validation
- 4.2 Project Conception Stage
- 4.3 Project Delivery Stage
  - A. Delivery Method & Selection Procedures
  - B. Construction Delivery Methods
  - C. Design Delivery Methods
- 4.4 Design Stages
  - A. Definitions
  - B. Expectations of Design Team
  - C. Cover Sheets
  - D. System Selection Design Phase
  - E. Schematic Design Phase
  - F. Design Development Phase
  - G. Construction Documents Phase
  - H. Contract Documents Phase
  - I. Pre-Construction Stage

- 5.0 DFCM Quality Assurance Requirements**
  - 5.1 General
- 6.0 Cost Model Requirements**
  - 6.1 General
  - 6.2 Standards
  - 6.3 Cost Model Report Table of Contents
  - 6.4 Scope of Estimate
- 7.0 Project Manual Requirements**
  - 7.1 General
  - 7.2 Preferred Source Documents
  - 7.3 Construction Guarantees and Warranties
  - 7.4 Product and Service Life cycle Requirement
  - 7.5 Materials
- 8.0 CAD Requirements**
  - 8.1 General
  - 8.2 Standards
    - A. CAD Standards
    - B. CAD Software
  - 8.3 Guidance
    - A. Assumptions
    - B. Other Design Tools
    - C. Quality of Drawings
    - D. Project CD
  - 8.4 CAD Layer Guidelines-Supplemental Requirements
  - 8.5 Uniform Drawings Standards - Supplemental Requirements
    - A. Drawing Set Organization
    - B. Sheet Organization
    - C. Schedules
    - D. Drafting Conventions
    - E. Terms and Abbreviations
    - F. Symbols
    - G. Notations
    - H. Code Conventions

# DESIGN PROCESS

## 1.0 GENERAL

### 1.1 General

- A. The Design Process applies to the capital development and capital improvement activities of DFCM. It contains specific information for the preparation of contract documents administered by the Division of Facilities Construction and Management. It delineates and supplements (either directly in the document or indirectly by reference) codes, industry recognized standards, and guide specifications. Many of the criteria are based upon the experience of DFCM and the input of professional and industry representatives.
- B. Each entity which has a contract with DFCM will be evaluated on its performance in accordance with the Design Process which includes both self-performed work and the performance of its subconsultants. As a result, it is critical that the A/E, which is in contract with DFCM, communicate to its subconsultants the requirements of the Design Process and that the subconsultants communicate to the A/E and DFCM any deviations from the Design Process.

### 1.2 Related Documents

- A. The Design Process (refer to <http://dfcm.utah.gov/>) includes the following documents which are incorporated herein by reference:
  - 1. Programming Standards documents requirements for Facility Program documents. Refer to <http://dfcm.utah.gov/>
  - 2. Design Requirements documents DFCM requirements which have resulted from DFCM's expertise and experience from previous projects. Refer to <http://dfcm.utah.gov/>
- B. DFCM incorporates by reference Codes, Standards, Rules, and Regulations in the Design Requirements document.
- C. Date of Applicable Documents
  - 1. The date of the applicable Design Process, Regulatory, and Standards documents shall be defined as follows:
    - a. For the facility program, this date is usually the scheduled end date for completion of the Facility Program;

- b. For the facility design and construction, this date is usually the date of the design contract.

### **1.3 Communication**

- A. DFCM's Designated Representative shall arrange for implementing an effective process for communicating with Agency for the purposes of determining facility requirements, Agency's inquiries, and concerns related to the project.

### **1.4 Conflicts, Exclusions, Omissions, and Revisions**

#### **A. Conflicts**

- 1. In case of conflict between any of the provisions of the Design Process and other requirements, the most stringent requirement shall govern.
- 2. In cases where references in the Design Process have changed or are otherwise incorrect, document issues to DFCM's Designated Representative.

#### **B. Exclusions**

- 1. Where any requirement cannot be applied due to project specific requirements that conflict with the Design Process, they will be considered for exclusion. A requirement may be excluded only when the exclusion may not affect DFCM's ability to deliver high quality facilities and does not absolve DFCM, or entities which contract with DFCM, from the responsibility to provide facility realization services that comply with the Design Process.
- 2. DFCM's Designated Representative is responsible for submitting exclusions from the Design Process for a specific project to the Director of DFCM. The Director has the responsibility and authority for examining whether the proposed exclusions are appropriate and for approving them.

## **2.0 PROJECT SPECIFIC REQUIREMENTS**

### **2.1 Image to Public and Occupants**

#### **A. General**

- 1. The facility shall be economically efficient considering the function to be performed and the life expectancy of the structure.

2. Provide facilities that are aesthetically compatible with the function and importance of the facility. Obtain permission from DFCM's Designated Representative to expose facility components which detract from the aesthetic quality of the facility.
3. Review aesthetic features, which are defined as architectural elements other than finishes that are not required for the facility to function efficiently for the Agency, with the DFCM's Designated Representative. Examples of aesthetic features are: atriums, fountains, skylights, spaces with excessive volume, and exterior free standing architectural elements.
4. Honor the context of the site.

**B. Appearance and Image of the Facility**

1. Determine, with the DFCM's Designated Representative, the required appearance and image of the facility.

Appearance and Image of the Facility	
Facility Category	Materials, Finishes, and Entry
Prestigious Facility: highly regarded by most people and very welcoming to visitors and staff.	The materials and finishes are prestigious and the best available. The approach and entry have convenient access and many welcoming features and enhancements.
Above Average appearance: regarded as attractive, clean, and welcoming to visitors and staff.	The materials and finishes are above average quality for the community. The approach and entry are above average and have some welcoming features and enhancements.
Average appearance: basically clean with approaches and entrances that project a standard image.	The materials and finishes are of a quality usually found in the community. The approach and entry present a standard appearance of an office building.
Overall appearance of the facility and of the entrance is of minimum significance.	The materials and finishes are of a quality usually found in industrial facilities. The approach and entry present a standard appearance of an industrial building.

## **2.2 Budget**

- A. Provide Design Services that do not exceed the project budget in the Agreement with DFCM.
- B. The project budget, which must not be exceeded in order to have a successful project, is established prior to the commencement of the design of the project.

1. In projects where the services of an A/E are procured, the A/E with DFCM shall develop a cost model within the budget for the construction of the project. The different portions of the cost model will be assigned to the A/E and the Design Subconsultants for identifiable elements of the project. Refer to the Cost Model Requirements for additional requirements.

C. Alternates

1. Obtain approval from DFCM's Designated Representative for any alternates prior to advertisement. Do not exceed six alternates, unless approved by DFCM's Designated Representative.
2. Describe completely all bidding alternates.
3. Do not increase the scope of the original project with alternates.
4. Specify only additive alternates and only with the intent of keeping the project within the construction budget.
5. Do not include in an alternate work which is an integral part of the project.

## 2.3 Schedule

- A. Provide Design Services that are completed on schedule as documented in the Agreement with DFCM for the specific project.
1. Written approval of any changes in the schedule is required from DFCM's Designated Representative.

## 2.4 Agency Related Requirements

- A. Provide Design Services, within the constraints of the Design Process and other DFCM specified constraints, which meet requirements specified by the Agency, requirements not stated by the Agency but which are necessary for the intended use, statutory and regulatory requirements, and additional requirements specified by the participants in the Facility Program (if one is prepared).
1. Minimize the disruption of the Agency's mission.
  2. Provide a facility that has a reasonable degree of flexibility to permit future reasonably foreseeable changes in use.

# 3.0 REGULATORY, STANDARDS, AND DFCM REQUIREMENTS

## 3.1 General

- A. Document in the Basis of Design the assumptions utilized in the design, including codes and other regulatory requirements (including dates and amendments), consensus based standards, and DFCM requirements.



- B. Comply with all applicable laws, rules, and regulatory requirements. Regulatory requirements include (but are not limited to) the documents referenced in the Design Requirements.
  - 1. A/E shall be responsible to submit the Contract Documents and obtain approval from all Authorities Having Jurisdiction.
- C. Utilize design practices and provide facilities (including products and services incorporated into facilities) that comply with current editions of consensus based standards.
  - 1. Exceptions
    - a. If a proposed system is not designed in accordance with a consensus based standard, notify the DFCM's Designated Representative. This requirement provides DFCM the opportunity to determine whether the risk of an option that does not comply with a consensus based standard is acceptable.

## **4.0 PROJECT PROCESS**

### **4.1 General**

- A. This section defines, in general, the stages in the facility life cycle based upon the Construction Specification Institute's Project Resource Manual. The DFCM's Designated Representative has the flexibility to adapt or combine stages to the needs of the project subject to DFCM processes and procedures.
- B. Meeting Requirements
  - 1. The A/E shall be responsible for arranging for meeting agendas and meeting minutes.
  - 2. Meeting Minutes
    - a. Record attendance, document action items, and document distribution of the meeting minutes. Action items include project related direction given to any project participant during the meeting or prior to the meeting which has not been documented.
- C. Documentation Requirements
  - 1. DFCM encourages document submittals to be submitted in digital pdf format; however, provide paper copies in accordance with agreements and as required to fulfill requirements. Copies in digital format may be

transmitted by email, except for copies which shall become a permanent record which shall be submitted in DVD format.

2. Permanent Record Documents include:
  - a. System Selection
  - b. Schematic Design
  - c. Design Development
  - d. Contract Documents
3. Digital Documents in pdf, DWG, DGN, DOC, XLS, and similar formats.
  - a. Documentation of Virus Free Format: Virus Scanning Software, Version, Date; Scan Date.

D. Verification

1. DFCM expects that each project task can be completed right the first time. In order to meet this expectation, the goal is to eliminate nonconformity by concentrating the efforts of all participants necessary to contribute to proper planning. Without proper planning, rework absorbs resources that often results in compressing the schedule which can increase costs, cause additional schedule compression, and reduce quality. To avoid rework, DFCM requires that each member of the A/E team is expected to verify that their work is complete prior to submitting it for observation by DFCM or its agents. DFCM's verification process shall not be a substitute for the verification process required by the parties in contract with DFCM and shall not relieve these parties of their responsibilities.
  - a. All participants shall familiarize themselves with the existing site and facility conditions as a prerequisite prior to their participation or presentation of a proposal. If the participant does not comply with this prerequisite, changes in the participant's scope of work that could have been avoided by compliance with this prerequisite shall not be accepted.
  - b. Notwithstanding this expectation, it is understood that the planning, programming, and design services develop through an iterative process; however, it is expected that the deliverables required at each phase of the process shall be substantially complete prior to obtaining approval of DFCM's Designated Representative to proceed to the next phase of the process. The reason for this requirement is to avoid compressing the schedule which contributes to poor quality. Major changes in approved documents shall be avoided and require approval of the DFCM's Designated Representative.

- E. Validation. The A/E shall fully cooperate in providing information required to validate the design.
  - 1. DFCM may validate, or arrange to have validated, that the work process and the facility complies with the Design Process, the Facility Program (if prepared), and other Agency Design Criteria. Refer to the related documents for Design Requirements.
  - 2. DFCM may arrange for the validation of the Structural Design by a Structural Engineering Peer Review. The Structural Engineering Peer Review shall be performed by a Utah registered SE experienced in similar project types.
  - 3. DFCM may arrange for the validation of the Energy Design for conformance with DFCM's energy conservation requirements by a Utah Professional Engineer specializing in mechanical engineering.
  - 4. DFCM may arrange for the validation of the Irrigation Design for conformance with DFCM's water conservation requirements by a certified Landscape Irrigation Auditor.

#### **4.2 Project Conception Stage**

- A. All DFCM projects start off as a need statement. The need statement can be as short as a few paragraphs, or it can evolve into a full program document. During this phase the scope and budget for the project are established. The program or needs statement is the guide to follow as the design progresses.
- B. DFCM shall assemble a steering committee which includes the appropriate representation from DFCM and the Agency to provide guidance to the design team throughout the process.
- C. DFCM shall allocate the funding in accordance with its procedures and prepare a schedule documenting the major milestones for the funded portions of the project. DFCM shall define project quality by requiring compliance with the Design Process and other specific requirements necessary for project success.

#### **4.3 Project Delivery Stage**

- A. DFCM shall determine the project delivery method and selection procedures. The project delivery method gives direction to the design process. Each delivery method brings with it a different set of expectation and requirements.
- B. Construction Delivery Methods:
  - 1. Construction Management/General Contractor (CM/GC): This method of construction is the preferred construction delivery method for the

development projects. The CM/GC assists the A/E by preparing a project schedule, cost estimating the designs presented at the different stages and different systems/components as required. The CM/GC also provides input on materials selected for availability, cost and constructability. The preferred method of design in this delivery method is the Single Bid Procurement as described below. An alternate to the single bid package is Multiple Bid Procurement.

2. Design-Bid-Build: The basis of this delivery method is that design is completed prior to selection of the contractor. Design is completed using the Single Bid Procurement process.
3. Design-Build: DFCM contracts with a single-entity for the complete design and construction of a project. The selection of this delivery method requires approval of the Director. Either the Single Bid or Multiple Bid Procurement methods are acceptable in this construction delivery method.

C. Design Delivery Methods

1. Single Bid Procurement: Design is complete for each A/E and the contract documents are issued in a single bid package.
2. Multiple Bid Procurement: “The Building Official is authorized to issue approval for the construction of foundations or any other part of a building or structure before the construction documents for the whole building or structure have been submitted, provided that adequate information and detailed statements have been filed complying with pertinent requirements of this code.” The project is separated into two bid packages. Construction can start while the remaining design elements are completed. Design Development shall be completed for all disciplines prior to issuing contract documents for any early bid package. The two bid packages are:
  - a. Site Grading, Utilities, Footings, Foundations, Core and Shell Bid Package: Includes all documents necessary for demolition, relocation, and construction of site utilities, including site grading, overall building layout, excavation, and structural elements for the primary structural framing system, stairs, elevators, major mechanical and electrical equipment and exterior skin. The A/E documents shall include final overall building dimensions including slab edges, slab openings, and all information necessary to prepare the structural shop drawings.
  - b. Final Bid Package: Includes contract documents for all other elements to be incorporated into the project.

#### 4.4 Design Stages

Note: If the project is small and uncomplicated the different design stages may be combined with approval of the DFCM Designated Representative.

##### A. Definitions:

1. “Basis of Design” Basis of Design and Assumptions for each Design Discipline. This document conveys the essence and important features of the project along with the different options for each of the systems. The document should contain information such as square footage, space efficiency and comparisons with the program requirements. Include a description of any additional spare capacity included in any of the engineered systems. Summarize the codes that will apply and submit a code analysis.
2. “Cost Model” This document refers back to the Basis of Design document and informs the steering group about the cost implications of the different systems. The Cost Model must include appropriate contingency for undocumented design issues.

##### B Expectations of Design Team.

1. DFCM expects that the A/E, together with its subconsultants, have responsible charge of the Design. The A/E shall designate the person who is in responsible charge of a specific design service for a specific project and through a qualification’s process assure DFCM that the person is qualified legally and by experience to perform the specific design service. This designated person shall be the primary day to day contact for the discipline throughout the project.
2. The goal is a quality coordinated design that minimizes the need for RFI’s or change orders, and achieves a high value for cost. It is necessary that drawings, notes, and specifications be coordinated so as to minimize conflicting provisions. A design that relies upon a preponderance of vendor expertise and design effort, generally, will not accomplish this goal. Include the necessary expertise in your A/E team. Obtain permission from DFCM for the use of any performance specifications which do not show the extent of the work on the drawings and which are significantly a product of vendor input. Coordinate all work between disciplines.
3. DFCM may utilize the services of an independent commissioning agent. The A/E shall coordinate with the selected commissioning agent to incorporate the commissioning requirements in to the specification. The commissioning agent shall provide the information that must be included in the specification. The goal of the commissioning agent is to focus on key systems identified with DFCM that, from past experience, have been

problematic. The commissioning agent validates that the key systems will comply with the Design Process, DFCM's Project Constraints, and the Basis of Design at each phase of the project after their services have been procured.

- C. DFCM has established cover sheets for the drawings for each design phase. These are available through the DFCM web site. Utilize these cover sheets for each submittal phase to DFCM.

D. System Selection Design Phase

1. In the System Selection Design phase (at approximately 50% to 75% completion of Schematic Design), the A/E shall confirm the facility program requirements defined in the facility program document or as otherwise defined by DFCM.
2. The A/E shall document its Basis of Design including any design assumptions, and confirm the assumptions with the authorities having jurisdiction, the Agency and DFCM.
3. The A/E shall provide the steering committee with system options and evaluate the impact of each. Adjust the allocation of resources within the cost model, without exceeding the budget, based upon the direction from the steering committee. Obtain mutual agreement in order to proceed.
4. System Selection Submittal Requirements:
  - a. Written Requirements:
    - (1) Basis of Design
    - (2) Cost Model with system narratives for each option.
  - b. Drawings Requirements
    - (1) Use the DFCM provided cover sheets and input the required information.
      - (a) Other Drawing Requirements
        - Plan North/True North Symbol: Show on all plans in the lower right hand corner of the drawings.
        - Plan Orientation: Orient plans consistently throughout the set of drawings.
        - Graphic Scale: Show graphic scale for all drawings or views.

- (b) Comprehensive List of Sheets
  - (c) General Sheets
- (2) Civil
  - (a) Civil Drawings: should include information on such items as existing benchmarks, lot lines, distance from existing buildings, existing and new utility lines and proposed footprint of the new structure.
- (3) Landscape
  - (a) Potential landscape areas.
- (4) Architecture
  - (a) Architectural Drawings: should include floor plans and room names, exit pathways and exterior rough elevations to show the essence of the building material types.
- (5) Structural
  - (a) Structural Drawings: should include basic information on grid lines, bay spacing and locations for lateral force resisting elements.
- (6) Mechanical
  - (a) Mechanical Drawings: should include basic information on system locations, connection points and utility sizing and capacity.
- (7) Electrical
  - (a) Electrical Drawings: should include basic information on system locations, connection points and utility sizing and capacity.
- (8) Communications
  - (a) Communications: should include basic information on system locations, connection points and utility sizing and capacity.

E. Schematic Design Phase

1. Continue to develop and refine the system selection requirements.
2. In the Schematic Design phase, the A/E documents the general extent, scale, and relationship of the project components, the type of construction and incorporates the systems selected in the previous phase.
3. The A/E shall be responsible to communicate with the State Fire Marshall's Office to receive any direction required to move to the next phase of design.
4. Schematic Submittal Requirements:
  - a. Written Requirements.
    - (1) Updated basis of design and assumptions for each Design Discipline
    - (2) Updated Cost Model
    - (3) Project Manual (refer to CSI Project Resource Manual)
  - b. Drawing Requirements. Continue to refine the previous drawings and add the following information.
    - (1) General
      - (a) Key Plans: show key plans on all drawings where one element requires two or more drawings to delineate a level.
      - (b) Column Grid Lines: show on all views, except that they may be omitted on Civil, Landscape and Site Plans.
    - (2) Civil
      - (a) Symbol Legend and Abbreviation List
      - (b) Site Demolition Plans
      - (c) Civil Site Utilities Plans
      - (d) Civil Utility Profiles
      - (e) Civil Utility Sections
      - (f) Civil Utility Details and Notes
    - (3) Landscape
      - (a) Concept landscape areas.



- (4) Architecture
  - (a) Symbol Legend and Abbreviation Lists
  - (b) Roof Plan
  - (c) Floor Plans
  - (d) Penthouse roof plan: Show on the same drawing if possible. Skylights.
  - (e) Exterior Elevations
  - (f) Sections
- (5) Structural
  - (a) General Structural Notes/Design Criteria
  - (b) Foundation Plans and Slab-On-Grade Plans
  - (c) Floor and Roof Framing Plans
- (6) Fire Protection
  - (a) Symbol Legend and Abbreviations List
- (7) Mechanical
  - (a) Mechanical Plans
  - (b) Mechanical Equipment Schedules (Boiler, Chiller, Cooling Tower, Air Handlers, etc.)
- (8) Electrical
  - (a) Lighting (Area, Horizontal IES category, Horizontal IES task illuminance, Design Issues): Site Lighting (Area, Illuminance, Design Issues).
  - (b) Power Quality {Design (%), Design Approach}; Neutral Conductor sizing for non-linear loads (Type, Design Approach).
  - (c) Symbol Legend and Abbreviations
  - (d) Electrical Site Plan
  - (e) Electrical Power Plans
  - (f) Electrical Schedules and Diagrams
- (9) Communications
  - (a) Structured Cabling Plans (Tt-1nn)
  - (b) Other Submittals

F. Design Development Phase

1. Continue to Develop and Refine the Schematic Design Requirements
2. After written approval of Schematic Design has been obtained from DFCM's Designated Representative, the A/E shall proceed with the design development phase of the project upon receipt of written confirmation to initiate the next phase of design. The design development phase fixes and describes the size and character of the entire project. In order for the project design to be considered successful, only minor modifications to the location of the facility on the site, the floor plans, and facility sections should be required during the Construction Documents Stage.
3. The A/E shall be responsible to communicate with the State Fire Marshall's Office to receive any direction required to move to the next phase of design.
4. Design Development Plan Review
  - a. The design professional shall meet with the building official to review the building code requirements of the proposed project.
  - b. A dimensioned site plan with distances to property lines, grades and location of new and existing buildings on the lot.
  - c. Complete code analysis which shall include the occupancy classification, type of construction, allowable area calculations and actual building area, height allowed in feet and stories, sprinkler requirements, exit width required and exit width provided, fire assemblies, and accessibility requirements.
  - d. Elevation drawings showings grades and height of building.
  - e. Typical floor plans
5. Design Development Submittal Requirements:
  - a. Written Requirements:
    - (1) Updated basis of Design and Assumptions for each Design Discipline.
    - (2) Updated Cost Model.
    - (3) Project Manual (refer to CSI Project Resource Manual)
    - (4) Code analysis and plan review

- b. Drawing Requirements: Continue to update and refine what was previously shown and add the following information.
- (1) General
  - (2) Landscape
    - (a) Concept Landscape Areas and Plans
  - (3) Civil
    - (a) Symbol legend and abbreviation
    - (b) Site demolition plan
    - (c) Site plan
    - (d) Grading plan
    - (e) Paving plan
    - (f) Civil site utility plan
    - (g) Civil utility profiles and sections
    - (h) Typical details
  - (4) Architecture
    - (a) Architectural Demolition Plan
    - (b) Layout of existing architectural elements identifying items to be demolished, relocated, or to remain.
    - (c) Building dimensions
    - (d) Floor Plans
    - (e) Roof elevations
    - (f) Exterior building elevations
    - (g) Wall sections
    - (h) Material selections
    - (i) Typical details
  - (5) Structural
    - (a) Classification for fire rated construction
    - (b) Special Inspection
    - (c) Lateral elements
    - (d) Typical details
    - (e) Structural Demolition Plans
  - (6) Fire Protection
    - (a) Fire Detection and Alarm Plans
    - (b) Fire Detection and Alarm Schedules and Diagrams
    - (c) Fire Suppression Details

(7) Mechanical

- (a) Symbol Legend and Abbreviations List
- (b) Mechanical Demolition Plans
- (c) Equipment schedules
- (d) Single line duct drawings
- (e) Mechanical piping plans
- (f) Plumbing general piping arrangements
- (g) Flow diagrams
- (h) Plumbing fixture schedules
- (i) Large Scale Mechanical Room Plans

(8) Electrical

- (a) Electrical Large Scale Plans
- (b) Electrical Details
- (c) Electrical Lighting Plans
- (d) Electrical Diagrams and Schedules
- (e) Electronic Security System, General
- (f) Electronic Security Sheets, Plan

(9) Communications

- (a) Communications Demolition Plans
- (b) Audio Visual Plans
- (c) Audio Visual Diagrams And Schedules
- (d) Structured Cabling Plans, Large Scale Views
- (e) Layout of communication rooms showing all components in the room. Show plan view layout of racks and equipment complying with TIA/EIA requirements.
- (f) Structured Cabling Schedules and Diagrams

(10) Interior

- (a) Interior Drawings
- (b) Interior Demolition Plans
- (c) Interior Plans

G. Construction Documents Phase

1. After written approval of the Design/Development Documents has been obtained from the DFCM's Designated Representative, the A/E shall proceed with the construction documents phase of the project. The construction documents are the written and graphic documents prepared or assembled by the A/E for communicating the project design for construction and administering the construction contract. The documents

are reviewed by the authorities having jurisdiction, members of the steering committee, and others selected by members of the steering committee.

2. Coordinate requirements for the following items with the DFCM's Designated Representative and assist DFCM as needed.
  - a. Project Identification
  - b. Description of Work
  - c. Type of Bid
  - d. Obtain list of contractors from DFCM's Designated Representative, if applicable.
  - e. Time of Completion
  - f. Liquidated Damages.
  - g. Pre-Bid Meeting
  - h. Evaluation and consideration of bids.
3. DFCM will initiate and prepare, with assistance as required from A/E, the following standard documents.
  - a. Notice to Contractors
  - b. Bid Form
  - c. Bid Bond (DFCM)
  - d. Bidder's Proposed Subcontractors (DFCM)
  - e. Contractor Agreement Form (DFCM)
  - f. Payment Bond (DFCM)
  - g. Performance Bond (DFCM)
  - h. Certificate of Substantial Completion (DFCM)
  - i. General Conditions (DFCM)
  - j. Supplementary Conditions
4. Construction Documents Submittal Requirements
  - a. Written Requirements:
    - (1) Updated basis of Design and Assumptions for each Design Discipline.
    - (2) Updated Cost Model
    - (3) Specifications: In written form on drawings or separate book, covering the following:
      - (a) Masterformat 2004; all divisions used on project.
      - (b) Material description.
      - (c) Installation description (when not shown on drawings).

- (4) Fault current calculations and coordination study.
  - (5) Project Manual: (refer to CSI Project Resource Manual)
    - (a) Energy model report
    - (b) Code analysis
    - (c) Inspection requirement
  - (6) Source of Specifications Identified. If A/E incorporates any proprietary specifications or any proprietary portion of its work from a source other than A/E, then such original source must be clearly identified in the A/E's work in order for DFCM to be aware of its identity and to be able to accept or reject such use of said proprietary source. Only those items specifically approved for "sole source" in writing by the Director of the Division of Facilities construction and management may be used as a "sole source" specification. In all specifications, the provision of Utah code, Title 63, Chapter 56, the Utah Procurement code, and all applicable rules enacted pursuant thereto, must be fully complied with the A/E.
- b. Drawing Requirements: Complete, coordinated drawings ready for final review and comment by DFCM, the Agency and Authorities having jurisdiction include the following:
- (1) Project Title Page: Template provided by DFCM.
  - (2) Seals Page
  - (3) List of Drawing Sheets
- c. The A/E will provide the following documents required for Building Official review and approval.
- (1) Site Plan.
    - (a) Property description:
      - Written "Legal Description" of property boundaries.
      - Survey information
      - Geotechnical/soils report, stamped, signed and dated by a P.E.
      - Existing hazardous materials information
  - (2) Construction Description Table
    - (a) Use or occupancy
    - (b) Type of construction

- (c) Square footage allowed.
  - (d) Actual square footage of proposed structure.
  - (e) Height of proposed structure in feet and stories.
  - (f) Area increase allowances for:
    - Yards
    - Stories
    - Fire walls
    - Automatic fire sprinkling system
  - (g) Occupancy separations
  - (h) Means of egress. Show the location, construction, size and character of all portions of the means of egress. Construction documents shall designate the number of occupants to be accommodated on every floor, and in all rooms and spaces.
  - (i) Design occupant loads
  - (j) Accessibility requirements
- (3) Structural Calculations: Stamped, signed and dated by the engineer of record.
- (4) Fire Assemblies: Detailed on the drawings for walls, floor/ceiling assemblies and roof/ceiling assemblies as per “design number” or “file number” of one of the current publications of the following:
- (a) Fire resistance tables of Chapter 7 of the International Building Code.
  - (b) “Fire Resistance Directory,” Underwriter’s Laboratory.
  - (c) “Fire Resistance Design Manual,” Gypsum Association.
  - (d) ICC evaluation reports.
- (5) Flood Control/Drainage Drawings: As required, stamped, signed and dated by a professional engineer.
- (6) Special Inspection: The registered design professional in responsible charge shall submit a statement of special inspection. The statement shall include a complete list of materials and work requiring special inspection and the inspections to be performed.
- (7) Performance Based Design: Include any performance based design which has been approved by the building official.

## H. Contract Documents Phase

1. After the construction documents have been modified to comply with requirements of the authorities having jurisdiction and requirements of the steering committee written approval by the DFCM's Designated Representative is required to issue the Contract Documents.
  - a. Provide two complete and corrected sets of drawings. Drawings shall be wet-stamped, signed and dated by a State of Utah licensed Architect or Engineer and submitted for approval by the State Building Official. One set to be retained by DFCM, the other set to be given to the General Contractor and kept at the construction site.

## I. Pre-Construction Stage

### 1. General

- a. Each system or group of systems shall be integrated with other system components prior to release of the shop drawings by the A/E team and the Contractor team for construction. Pre-installation meetings are normally required for:
  - (1) Site and Infrastructure
  - (2) Facility Structure and Skin, including curtain walls and masonry.
  - (3) Building Systems (Mechanical, Electrical, Plumbing, Building Automation, Fire Alarm)
  - (4) Life Safety and Security Systems (Fire Protection, Fire Alarm, Security Electronics, Door Hardware)
  - (5) Roofing

### 2. Pre-Construction Meeting

- a. DFCM's Designated Representative shall arrange for a preconstruction meeting. Shop drawing scheduling shall be coordinated so that the information is available for each discipline and trade to review and coordinate prior to the Pre-installation conference.

### 3. Pre-Installation Conference

- a. During the pre-installation conference, the A/E team and the contractor team (all members required to coordinate a system or group of systems) shall meet and resolve any issues related to shop drawing coordination and RFIs.



- b. Within 10 working days, after the pre-installation conference, responses to RFIs and construction modifications shall be issued by the A/E.

## **5.0 DFCM QUALITY ASSURANCE REQUIREMENTS**

### **5.1 General**

- A. DFCM has determined that many of the Quality Control problems can be reduced by a structured approach to interdisciplinary coordination and integration. The A/E shall integrate the drawings and specifications of all disciplines. The A/E shall inform DFCM of the process they will implement with the design team for dimensional control and comprehensive coordination of all elements of each of the following:
  - 1. Site Plan
  - 2. Floor Plan
  - 3. Reflected Ceiling Plan
  - 4. Exterior Elevations
  - 5. Selected Interior Elevations with cabinets or other types of complexity in the elevations.
  - 6. Sections at locations where above ceiling systems are congested shall delineate all building systems (e.g. Structural elements, Mechanical piping and ductwork, Electrical conduit and cable trays, and Fire Protection piping).
  - 7. Division 1 sections of the specifications.
- B. DFCM has determined that the functionality of systems can be improved and the costs reduced by the integration and convergence of building systems. The A/E shall implement a process with the design team for the comprehensive coordination of all elements. Elements that are typically a concern include:
  - 1. Communication Systems (structured cabling, audio-visual systems, other similar systems, and structured cabling connections to other electronic systems).
  - 2. Integrated Automation Systems (HVAC control, lighting control, electrical monitoring, monitoring of equipment, fire alarm).
  - 3. Security and Life Safety Systems (security systems, fire alarm systems, fire protection systems, door hardware, and similar systems).
  - 4. Equipment Connections (HVAC, electrical, plumbing).

## **6.0 COST MODEL REQUIREMENTS**

### **6.1 General**

- A. The goal of the Cost Model Requirements is to provide clear criteria which the cost models and bids for a facility must meet to achieve DFCM's requirements for the project to be considered successful.
- B. The DFCM's Designated Representative shall define in the "Agreement between the DFCM and A/E" the Cost Model submittals required by the A/E. Unless otherwise indicated in the "Agreement Between DFCM and A/E," Cost Models are submitted at the following phases:
  - 1. Programming
  - 2. System Selection
  - 3. Schematic Design
  - 4. Design Development
  - 5. Construction Documents
- C. The A/E shall prepare a Cost Model at each phase of the Design which identifies a sub-cost model for each discipline. Based upon this Cost Model, the A/E with each of the Design Subconsultants shall summarize in the Cost Model narrative what can be constructed in accordance with the Cost Model. Document any variances that do not comply with the Design Process, Facility Program, or Agency Requirements. Prepare design document submittals that comply with the Cost Model.

On projects where a CM/GC has been selected the CM firm will be responsible for providing an additional cost estimate. The CM/GC and the design team must work together to reconcile any differences between the two cost estimates. The project may only proceed once the cost estimate is agreed upon.
- D. If the Steering Committee determines that the design for an element of the project does not comply with the project requirements, the cost model shall be adjusted and documented; however, the project budget shall not be exceeded.
- E. At each cost model submittal, the Cost Consultant (member of the A/E team) and/or Contractor shall independently review that the cost model for the A/E team shall not be exceeded based upon the narrative and supporting documents provided at each phase of the design.
- F. DFCM defines Construction Contingency as funds for unforeseeable conditions and design errors and omissions after the time of contract award. Reasonable allowance for all foreseeable work items must be made in the cost model.

## **6.2 Standards**

- A. The Cost Model shall be prepared according to the Construction Specification Institute's uniform classification of construction systems and assemblies.
  - 1. RS Means is an acceptable source of cost information as long as it is adjusted to local market conditions and project requirements.
  - 2. Exception: a proprietary Cost Estimating data base may be utilized when validated by objective evidence and approved by DFCM's Designated Representative.

## **6.3 Cost Model Report Table of Contents**

- A. Executive Summary
  - 1. Project Summary: Brief summary of overall project, including total square footage (current vs. program), net square footage (current vs. program), and space efficiency (current vs. program);
  - 2. Funding
  - 3. Total Construction Cost Model: Facility Cost (Lump Sum, Cost/gross sf), On-site Cost (Lump Sum, Cost/gross sf), and Off-site Cost (Lump Sum, Cost/gross sf);
  - 4. DFCM Furnished Cost Model (Lump Sum, Cost/gross sf);
  - 5. Delivery Method
- B. Project Narrative
  - 1. Site Narrative
  - 2. Facility Narrative
- C. Construction Cost Model summarizing costs in the following categories.
  - 1. Footing and Foundation
  - 2. Structural Core and Shell
  - 3. Exterior Cladding
  - 4. Interiors
  - 5. Mechanical
  - 6. Electrical
  - 7. Fire Protection
  - 8. Special Demolition
  - 9. Civil/Site Work
  - 10. General: General Conditions, Fee, Design Contingency, Escalation Contingency, Construction Contingency

D. Assumptions and Qualifications

1. Market Conditions
2. Project Assumptions

**6.4 Scope of Estimate**

- A. Facility Program preliminary cost model requires a mixture of costs per functional space (such as office, classroom, etc.), cost per cubic foot, cost per square foot, and cost per linear foot (for items where the cost is not easily forecast by a cost per square foot model such as site utilities). In some cases, design options shall be selected to reduce the range of costs for the program. These design options shall be defined as assumptions.
- B. Schematic Design Cost model requires a mixture of cost per cubic foot, cost per square foot, and cost per linear foot (for items where the cost is not easily forecast by a cost per square foot model such as site utilities). The cost model shall be based upon the design options selected and other assumptions identified in the narrative.
- C. Design/Development Cost model shall be developed based upon unit costs for approximate quantities of materials and installation shown on the design development documents or identified in the assumptions.
- D. Construction Documents Cost model shall be developed based upon unit costs for actual quantities of materials and installation shown on the construction documents or identified in the assumptions.

<b>7.0 PROJECT MANUAL REQUIREMENTS</b>
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**7.1 General**

- A. The Project Resource Manual published by The Construction Specifications Institute serves as a reference document covering a wide range of information required by those involved in the Facility Development Process. As a generic standard, it informs the A/E about industry-wide expectations which must be adapted to the constraints of the Design Process and to specific project requirements.
- B. Apply CSI MasterFormat 2004 for organizing the numbering of sections, the SectionFormat for the organizing individual sections and the PageFormat for each individual page. (Note: MasterFormat 1995 may be utilized for projects with A/E agreements dated before January 1, 2006.)

- C. The only parties to the construction contract are the DFCM and Contractor. The A/E shall therefore address all instructions to the Contractor. Do not address individual subcontractors or trades.
- D. Provide an orderly and logical arrangement by complying with the CSI requirements that establishes a standard location for specific information and to state that information only in that location.
  - 1. Index all documents in the Project Manual.
- E. Edit guide specifications carefully to convey the necessary requirements for each project discipline. Avoid elaborate and expensive requirements for items that are not critical to the success of the project. Delete from guide specifications irrelevant items. Modify guide specifications to add clarity and special requirements to conform to project requirements.
  - 1. Coordinate Project Manual with Drawings.
  - 2. Carefully coordinate Structural General Notes with the specifications.
  - 3. Do not use lump sum allowances in any specification sections.

## **7.2 Preferred Source Documents**

- A. DFCM requires written disclosure and project manager approval if specifications are prepared by a manufacturer. Manufacturer written specifications generally should not be used in order to avoid unfair influence by a manufacturer in the procurement process.
- B. DFCM requires that specifications be prepared in compliance with CSI requirements and that the specification masters be prepared using a documented quality process.
- C. DFCM does not require, but accepts the Full Language version of ARCOM Masterspec or BSD SpecLink Construction Specifications as the specification template. They are derived independently from the manufacturers and because they follow a quality and tested process.

## **7.3 Construction guarantees and warranties shall:**

- A. Protect DFCM against faults, defects, or failure, in spite of technical compliance with the terms of the contract.
- B. Extend the manufacturer's responsibility beyond the end of the one year guarantee period on selected items as approved by DFCM.
- C. The one year guarantee period shall not limit the effect of warranties provided in or required by the contract. The Contractor shall correct failures during the one year guarantee period after substantial completion.

#### **7.4 Product and Service Life Cycle Requirement:**

- A. Assure there is a high value for the cost by:
  - 1. Maximize competition consistent with the purpose. In addition, minimize sole source procurements (Refer to <http://www.rules.utah.gov/publicat/code/r023/r023-001.htm>). Provide a minimum of three manufacturers for each material or installation, except where authorization from the Director of DFCM has been obtained for sole source procurements. The use of an “or equal” clause in the specifications shall define a process for determining “equal products or services” which requires approval by the A/E and shall not leave it to the vendor to make this determination.
  - 2. In order to avoid excessive addition and replacement costs, use open source and open protocol systems when possible.
    - a. Where proprietary software and service organizations are required to service a component, obtain price information for DFCM and the Agency identifying the long term cost (10 years) in order to include this in the evaluation.
  - 3. Provide facility components which are durable, with low failure rates, and low cost to maintain.
  - 4. New Technologies: Reduce life cycle costs by incorporating proven technologies in facilities, and by performing “due diligence” prior to procuring new technologies.

#### **7.5 Materials**

- A. Specify materials which are new, unless approved by DFCM’s Designated Representative. Provide certification or label with the name of the manufacturer or supplier and the approved testing laboratory where consensus based standards have been developed.

### **8.0 CAD REQUIREMENTS**

#### **8.1 General**

- A. The goal of the CAD Standards is to provide clear criteria which the Drawings for a facility must meet to achieve DFCM’s requirements. Comply with the requirements of the National Cad Standard as supplemented by this standard.

- B. Coordinate with DFCM's Designated Representative to determine the drawing format.
- C. The performance requirements are given as appropriate as minimum criteria to allow flexibility within the constraints of the CAD Standards. If a variance from the standard is desired, the approval of the DFCM's Designated Representative is required.

## **8.2 Standards**

- A. CAD Standards
  - 1. National CAD Standard, current version.
- B. CAD Software
  - 1. AutoCAD, current version
  - 2. Microstation, current version

## **8.3 Guidance**

- A. Assumptions
  - 1. Any CAD information that will be shared between multiple sheets, such as floor plans, should be contained in a separate CAD file. For AutoCAD the file would be an XREF.
  - 2. All disciplines shall use the same title block for all drawings submitted for the same project. For AutoCAD, create the title block as an X-ref.
- B. Other Design Tools
  - 1. Isometric and perspective views may be used to supplement and explain the design.
  - 2. Models and renderings may be used to supplement and explain the drawings.
- C. Quality of Drawings
  - 1. These documents shall convey to all participants the graphic information necessary for the required work. It is essential that the documents be accurate and explicit.
  - 2. All elements of the Contract Documents shall be properly coordinated to minimize conflicts between drawings and specifications.
  - 3. Include the extent, size shape and generic types of materials, and the relationship to other materials.
  - 4. Avoid duplication of items in Contract Documents. If items are duplicated, the A/E and Subconsultants shall carefully coordinate to prevent conflicts.

5. List all drawings in the index, including the cover sheet as the first sheet of the set.
- D. Project CD: A/E shall prepare Project CD that establishes the project setup for the other members of the A/E Team. Distribute Project CD at the kickoff meeting to all members of the project team. Include:
1. Title Block
  2. Common CAD Layers
  3. Common Fonts
  4. Model Files, such as floor plans
  5. Sheet files including title block information that varies with each sheet.
  6. Initial sheet index

#### **8.4 CAD Layer Guidelines - Supplemental Requirements**

- A. Layer Name: Use Mandatory Level 1 Discipline Designator, Mandatory Major Group, Optional Minor Group.
- B. Identify user-defined layers using standard alphanumeric format.

#### **8.5 Uniform Drawing Standards - Supplemental Requirements**

- A. Drawing Set Organization
1. Reference the border/title block and model files into a sheet file.
  2. Include a “ready-to-plot” sheet tab for both full size plotting and reduced size plotting.
  3. File Naming Convention: DFCM’s preference is to use two character discipline designators. One character discipline designators may be used for sheets that apply to all the drawings in a discipline or if the project is small. For small projects, the use of one character discipline designators must be approved by DFCM’s Designated Representative for the project.
- B. Sheet Organization
1. Use a common sheet size for all sheets for a specific project to facilitate filing hard copy documents, plotting capabilities, and to maintain a consistency for Facility Management users. Use Architectural Standard “D size” (24” X 36”) or “F size” (30” X 42”).
  2. Obtain written approval, prior to submitting sheets that vary from this standard, from the DFCM’s Designated Representative. Request shall be in writing and include a justification for the variance.



3. Sheet Margins:

Sheet Margins	
Top and Bottom Margin	1/2"
Left Margin	1-1/2"
Right Margin	3/4"

C. Schedules: Comply with National Cad Standards Module 03.

D. Drafting Conventions: Comply with Drafting Conventions Module 04

1. AutoCAD users should choose either the architectural (feet and inches) or engineering (feet and tenths).
2. Global Origin: The origin of a drawing file is important because it serves as the point of reference from which all other elements are located. Origins are typically defined (located) in a drawing file by the Cartesian coordinate system of x, y, and z or for AutoCAD users 0, 0, 0.
3. Title Block: For DFCM projects the title block area will be placed on each sheet in the NCS horizontal text format with the title block placed in the right hand margin of the border sheet. DFCM requires additional information in the standard blocks of the NCS format using a horizontal layout. Utilize the DFCM provided cover sheet template.
4. All revisions to the Contract Documents shall be accomplished using the delta symbol placed adjacent to the revised element with the most current revision number. The portion revised shall be clouded on the drawings encompassing the delta symbol. Only the current revisions shall have the clouded area depicted. Previous revision delta symbols shall remain, but the clouded line shall be erased or frozen. If an entire drawing is revised or a new drawing is added to the set, place the revision delta in the issue block. Include revision block with change order numbers, dates and descriptions.
5. Text/Fonts: For drawing content, use standard fonts provided with the CAD software. If specialty fonts are used in the title block, provide specialty font to DFCM.
6. Scale: Scale shall be expressed both numerically and graphically. For building project plans, use 1/8" or 1/4" scale, unless approved otherwise by DFCM's Designated Representative. Large scale views may use standard scales larger than 1/4". For Site plans, use 1/1, 1/10, 1/20, 1/30, 1/40, 1/50, 1/60, or 1/100 scale, unless approved otherwise by DFCM's Designated Representative.

- 7. Sheet Types: Comply with the requirements of the sheet types section of this module. Comply with the descriptions of requirements for plans generated by each discipline.
- E. Terms and Abbreviations: Comply with Terms and Abbreviations National Cad Standards Module 05.
- F. Symbols: Comply with the Symbols Module 06. Standard symbols ensure clear and concise communication.
  - 1. Exception No. 1: Lighting fixture symbols may be added to the symbol list which more graphically describe the lighting fixture, if identified on the symbol schedule.
  - 2. Exception No. 2: Fire alarm symbols that comply with NFPA 170 are preferred.
- G. Notations: Comply with Module 07.
- H. Code Conventions. Provide the code information as required in the design process and in the DFCM cover sheet templates.



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

**Division of Facilities Construction and Management**

**DFCM**

# DESIGN REQUIREMENTS

May 25, 2005

## **PREFACE**

In order for the Division of Facilities Construction and Management (DFCM) to be one of the nation's premier facility managers, it is essential that we consistently improve our performance. In order to do this, the Design Requirements provides a document and review process for consistently improving our processes and standards.

# DESIGN REQUIREMENTS

## TABLE OF CONTENTS

Preface

Table of Contents

### **1.0 GENERAL**

- 1.1 General
- 1.2 Procedure
- 1.3 Hierarchy of Requirements
- 1.4 Changes and Additions to Design Requirements

### **2.0 CODES / LAWS / RULES AND REGULATORY REQUIREMENTS**

- 2.1 DFCM Requirements Include
- 2.2 Building Code Commission
- 2.3 Fire Prevention Board
- 2.4 Accessibility Code
- 2.5 Labor-Industrial Commission
- 2.6 Department of Health
- 2.7 Department of Environmental Quality
- 2.8 County Health Department
- 2.9 Department of Commerce

### **3.0 DFCM REQUIREMENTS**

#### **3.1 GENERAL**

- A. Distributed Live Loads
- B. Energy Conservation Requirements
- C. Enhanced Accessibility
- D. Sustainable Design
- E. Hazardous Materials
- F. Vibration
- G. Utah Space Standards
- H. Infrastructure Flexibility

#### **3.2 CIVIL**

- A. Paving

#### **3.3 ARCHITECTURAL**

- A. Suspended Ceiling Systems
- B. Daylight and Outside Views
- C. New Roofing Requirements
- D. Replacement Roofing Requirements

- E. Waterproofing and Sealants
- F. Acoustical Quality
- G. Guardrails

### **3.4 STRUCTURAL**

- A. Concrete

### **3.5 MECHANICAL**

- A. Controllability of Systems
- B. Indoor Air Quality
- C. Plumbing General Requirements
- D. Water System
- E. Waste System
- F. Plumbing Fixtures and Equipment
- G. HVAC General
- H. Air Distribution
- I. Piping System
- J. Steam
- K. Natural Gas
- L. HVAC Equipment
- M. Integrated Automation
- N. Automatic Sprinkler Systems

### **3.6 ELECTRICAL**

- A. Emergency Electrical Requirements
- B. Lighting
- C. Raceways for 600 V
- D. Conductors
- E. Grounding
- F. Medium Voltage
- G. Controller
- H. Electrical Distribution
- I. Miscellaneous Electrical
- J. Structured Cabling
- K. Fire Alarm
- L. Misc Systems

### **3.7 LANDSCAPING**

- A. Irrigation Water
- B. Plant and Soil

# DESIGN REQUIREMENTS

## 1.0 GENERAL

### 1.1 General

- A. These Design Requirements apply to all plans, processes, and procedures required for compliance with the Design Process.

### 1.2 Procedure

- A. Complete the Design Requirement/Variance Form to make recommendations for additions, deletions, and changes to the Design Requirements.
- B. Complete the Design Requirement/Variance Form to request approval by the Director to vary from these Design Requirements based upon the specific project needs.
- C. All Design Requirement modifications require approval by the Director.
  - 1. If the Design Requirement is approved by the Director, then the DFCM's Designated Representative shall distribute the Design Requirements Procedure document to the appropriate project participants and shall file it in the project file.
  - 2. If the Design Requirement is approved by the Director and has general applicability to other projects, the Director shall arrange for the Design Requirement modification to be added to the appropriate document.
    - a. Verify with the DFCM person responsible for the specific professional discipline and the appropriate DFCM maintenance person that the proposed Design Requirement meets their requirements.

### 1.3 Hierarchy of Requirements

- A. The hierarchy of requirements is as follows:
  - 1. Comply with the minimum requirements of all applicable laws, rules, and regulatory requirements.
    - a. Exceptions: Wherever there are practical difficulties involved in carrying out these provisions, the State Building Official with the approval of the Director of DFCM and/or the State Fire Marshall shall have authority to grant modifications. The modifications granted by the State Building Official shall be documented in this standard under the heading "Design Requirements."
  - 2. Comply with the consensus based ANSI standards for design, products, installation, and services unless the applicable laws, rules, and regulatory requirements are more stringent.

3. Comply with the “Performance Requirements: Design Requirements” unless the ANSI standards or the applicable laws, rules, and regulatory requirements are more stringent.
4. Comply with the Contract Documents, unless the “Performance Requirements: Design Requirements”, the ANSI standards, or the applicable laws, rules, and regulatory requirements are more stringent.

#### **1.4 Changes and Additions to Design Requirements**

Complete the following document and submit it to the person to whom you are responsible to for ultimate decision by the Director, for requested changes/additions to the Design Requirements.



Design Requirement/Variance Change Request	
Project Name	Date
	DFCM Project Number
	Risk Management Number
Requested by	Entity
Brief Description of the Problem	
Design Requirements	
Justification	
Director Approval	Date
Action to Include This Design Requirements in the Design Requirements	
Professional Reviewer	Position
Maintenance Reviewer	Position
Director Approval	Date

## **2.0 CODES / LAWS/ RULES AND REGULATORY REQUIREMENTS**

### **2.1 DFCM requirements include (but are not limited to):**

- A. Administrative Services: Comply with Title R23: Administrative Services, Facilities Construction and Management. Refer to <http://www.rules.utah.gov/publicat/code/r023/r023.htm>
- B. DFCM Services: Comply with Services requirements. Refer to <http://dfcm.utah.gov>. Services requirements include:
  - (1) Inspections and Testing, refer to <http://dfcm.utah.gov/inspections/inspections.htm>
  - (2) Standards, refer to [http://dfcm.utah.gov/publications/dfcm\\_standards.htm](http://dfcm.utah.gov/publications/dfcm_standards.htm)
  - (3) Standard Project Documents, refer to [http://dfcm.utah.gov/publications/dfcm\\_standard\\_project\\_docs.htm](http://dfcm.utah.gov/publications/dfcm_standard_project_docs.htm)
  - (4) Roofing, Paving, and Hazardous Materials, refer to <http://dfcm.utah.gov/rphm/rphm.htm>
  - (5) Other requirements which may be added after this document is published.

### **2.2 Building Code Commission**

- A. Comply with Utah Uniform Building Standards Act. Refer to [http://www.dopl.utah.gov/licensing/statutes\\_and\\_rules/R156-56.pdf](http://www.dopl.utah.gov/licensing/statutes_and_rules/R156-56.pdf). Enforcement of these codes is the responsibility of the State Building Official.

### **2.3 Fire Prevention Board**

- A. Comply with Fire Codes in accordance with “Laws, Rules” of the State Fire Marshall. Refer to [http://firemarshal.utah.gov/Laws\\_Rules/laws\\_rules.html](http://firemarshal.utah.gov/Laws_Rules/laws_rules.html). Enforcement of these codes is the responsibility of the Utah Fire Marshall.

### **2.4 Accessibility Code**

- A. Comply with the US Department of Justice Federal Registers – Americans with Disabilities Act. Refer to <http://www.usdoj.gov/crt/ada/adahom1.htm>

### **2.5 Labor-Industrial Commission**

- A. Comply with requirements of the Labor-Industrial Commission. Refer to <http://www.labor.state.ut.us>.

- (1) Boiler and Pressure Vessel Compliance Manual, Refer to [http://www.labor.state.ut.us/Safety\\_Division/Regulation\\_Updates/BPVManRev7D.pdf](http://www.labor.state.ut.us/Safety_Division/Regulation_Updates/BPVManRev7D.pdf)
- (2) Utah Occupational Safety and Health, refer to <http://www.rules.utah.gov/publicat/code/r614/r614.htm>
- (3) Elevator Rules: American National Standard Safety Code for Elevators and Escalators, ANSI/ASME A17.1 with amendments administered by Labor-Industrial Commission of Utah, Department of Occupational Safety and Health Elevator Division. Refer to <http://www.rules.utah.gov/publicat/code/r616/r616-003.htm>

## **2.6 Department of Health**

- A. Comply with requirements of Department of Health. Refer to <http://www.health.utah.gov>.
  - (1) Health Care Rules, refer to <http://health.utah.gov/hflcra>
  - (2) Utah Indoor Clean Air Act, refer to <http://www.tobaccofreeutah.org/r392-510.htm>

## **2.7 Department of Environmental Quality**

- A. Comply with requirements of Department of Environmental Quality. Refer to <http://www.deq.utah.gov>.
  - (1) Public Drinking Water Rules, refer to <http://drinkingwater.utah.gov/rules.htm>
  - (2) Utah Division of Air Quality: R307-801, Asbestos, refer to <http://airquality.utah.gov/HAPS/ASBESTOS/rules/newrules.pdf> ; Environmental Protection Agency (EPA): Regulations for Asbestos – Code of Federal Regulations Title 40, Part 61 Subpart M; and Toxic Substances Control Act PART 763 (Updated 1997) – ASBESTOS: OSHA Standards 1910.1001, 1915.1001, and 1926.1101
  - (3) Underground Storage Tank Act, refer to [http://undergroundtanks.utah.gov/ust\\_rules/r311\\_rules\\_9\\_04.pdf](http://undergroundtanks.utah.gov/ust_rules/r311_rules_9_04.pdf)
  - (4) Air Conservation Act, refer to <http://www.rules.utah.gov/publicat/code/r307/r307.htm>
  - (5) Fugitive Dust Plan, Refer to <http://www.rules.utah.gov/publicat/code/r307/r307-309.htm>
  - (6) Utah Pollutant Discharge Elimination System, Refer to <http://www.rules.utah.gov/publicat/code/r317/r317.htm>
  - (7) Operating Permits of the Division of Air Quality, refer to <http://www.rules.utah.gov/publicat/code/r307/r307-415.htm>

## **2.8 County Health Department (for the county where the facility is located)**

- A. Food Service Sanitation Rules

## 2.9 Department of Commerce

- A. Pipeline Safety, refer <http://www.rules.utah.gov/publicat/code/r746/r746-409.htm>
- B. Qualifications: Refer to the Project Participants heading of this document.

## 3.0 DFCM REQUIREMENTS

These requirements are enhancements of code requirements that DFCM has initiated for best practices for State owned facilities.

### 3.1 GENERAL

#### A. Distributed Live Loads

##### Design Requirements

Modify IBC Table 1607.1 “Minimum Uniformly Distributed Live Loads and Minimum Concentrated Live Loads” by the following:

Increase the Uniformly Distributed Live Loads to 80 psf for: Office use in Access floor systems; Operating room, laboratories, private rooms, wards in Hospitals; Reading rooms in Libraries; Offices in Office buildings; Classrooms in schools.

Increase the Minimum Concentrated Live Loads to 2500 lbs for: Office use and Computer use for Access floor systems; Operating rooms, laboratories, corridors above the first floor for Hospitals; Reading rooms, Stack rooms, Corridors above first floor in Libraries; Lobbies and first-floor corridors, offices, corridors above first floor in Office Buildings; Classrooms, Corridors above first floor, First floor corridors in Schools.

#### B. Energy Conservation Requirements

##### Design Requirements

Design facilities (except residential facilities) to reduce by 10%, or more, the energy cost using current utility rates, as compared to the performance of a reference building prescribed in Appendix G of ASHRAE/IESNA 90.1. Calculate the percentage of energy conservation savings (ECS) by dividing the proposed energy cost budget for the proposed facility (PR) by the reference building (addendum e) cost budget (BL) and subtracting the result from 1 and multiplying by 100 will give the percentage of energy cost savings:  $\% ECS = 100 (1-PR/BL)$ .

In order to achieve these requirements, DFCM requires that the Engineer design in accordance to the requirements of ASHRAE/IESNA 90.1 and not use the exception in Section 701.1 of the International Energy Conservation Code. The DFCM’s Designated Representative may authorize exemptions to the 10% energy cost savings requirement for existing buildings so long as the

building complies with the minimum requirements of ASHRAE 90.1 paragraph 4.1.2 and the related subparagraphs. The Director of DFCM may authorize a lower level of energy efficiency when the standard is not achievable due to the unique circumstances of a particular project or the constraints of the project budget.

In order to achieve the most cost effective energy savings, DFCM requires compliance with the minimum requirements set by the mandatory and prescriptive requirements of ASHRAE/IESNA 90.1.

The 10% energy cost savings shall be documented through simulation of both the reference facility and the proposed facility, using the methodology in ASHRAE 90.1 Informative Appendix G and a DOE 2.x energy simulation program. The required schematic design submittal shall include the documented model for the reference building. The required design/development submittal shall include revisions, if necessary, to the documented model for the reference building and a progress model for the proposed building. The required construction documents submittal shall include revisions, if necessary, to the documented model for the reference building and a documented model for the proposed building validating the 10% energy cost savings. In addition, Mandatory and Prescriptive Compliance shall be demonstrated by including the Envelope Compliance Certificate, Mechanical Compliance Certificate, and the Lighting Compliance Certificate from COMcheck-EZ for the most current software for ASHRAE 90.1. Alternatively, for LEED projects the LEED validation for 10% energy conservation savings may be substituted.

DFCM wishes to participate, when possible, with Utah Power under their Energy Finance Program.

### **C. Enhanced Accessibility**

#### **Design Requirements**

“It is the policy of the Utah State Building Board that, when appropriate for the intended use of the building and achievable within the project budget, the following accessibility enhancements beyond those required by the Americans with Disabilities Act be provided for in state owned buildings and buildings leased by DFCM: (1) powered door openers for the primary entrance designated for use by people with disabilities, and (2) powered door openers for one uni-sex restroom or for one male and one female restroom in the building unless restrooms with a door-less entry are provided. This policy is not intended to limit the use of powered door openers to the standard set forth herein. This policy applies to the construction or major renovation of state-owned facilities and new leases where the entire building is being leased by DFCM. This policy is not intended to create any rights to any third parties.

Determinations that one or both of these enhancements are not appropriate for the intended use of the building or not possible within the project or lease budget shall be made by the Director or his designee. Determinations of whether this enhancement to accessibility is appropriate should consider the potential of access by people with disabilities. The Director may determine that powered door openers are appropriate for the primary entrance while not warranted or not possible within the budget for access to restrooms. The Director may also determine that one or

both of these enhancements are not feasible in (a) the renovation of an existing building due to its design or configuration or (b) in a leased facility due to the nature and circumstances of the lease.”

#### **D. Sustainable Design**

##### **Design Requirements**

Utilize LEED™ as a checklist of opportunities to improve environmental quality and energy efficiency; however, it is DFCM’s policy not to apply for LEED™ certification. Make recommendations of which opportunities should be implemented in accordance with budget constraints to the DFCM’s Designated Representative. Obtain approval of DFCM’s Designated Representative prior to implementing recommendations.

#### **E. Hazardous Materials**

##### **Design Requirements**

DFCM shall procure a qualified abatement consultant during the Schematic Design phase of the Design stage. The abatement consultant shall survey all renovation and demolition projects for hazardous materials such as asbestos-containing building materials, lead-based paint, mold, universal wastes such as PCBs, CFCs, mercury, household/janitorial cleaning products, identified/unidentified containers of chemicals or products, or any other materials or waste that may be environmentally unsafe.

Prior to the start of a survey by the abatement consultant, the A/E shall provide drawings at the design development phase of the design stage to the abatement consultant with sufficient information to define the building or facility areas affected by the renovation or demolition. The abatement consultant shall coordinate abatement documents with the updated Contract Documents prior to final preparation. The abatement consultant shall prepare a complying and comprehensive hazardous materials survey report identifying and quantifying all hazardous and non-hazardous building materials to include asbestos-containing building materials, lead-based paint, mold and universal wastes that affect the areas of renovation or demolition.

DFCM shall procure a qualified abatement contractor to remove all hazardous materials prior to the beginning of any building demolition or renovation.

## F. Vibration

### Design Requirements

Design structure in accordance with the following minimum requirements for vibration:

Vibration	
Space Category	Vibration Sensitivity
Laboratories with equipment sensitive to vibration	Comply with manufacturer's requirements for vibration.
Offices, classrooms, and other similar spaces.	There are no vibrations from machines or traffic which are detectable by people.
Common Area spaces.	There is occasional movement in the floor when heavy equipment are moved nearby.
Storage spaces.	There is obvious and annoying movement when people walk by or equipment is being moved nearby.

## G. Utah Space Standards

### Design Requirements

Comply with the "Utah Space Standards," August 1994. Refer to [http://dfcm.utah.gov/publications/publications\\_files/space\\_standards.pdf](http://dfcm.utah.gov/publications/publications_files/space_standards.pdf)

## H. Infrastructure Flexibility

### Design Requirements

Interior Shear Walls: Minimize interior shear walls, bearing walls and braced frames which may disrupt future additions or modifications to the facility.

Spare Mechanical Space: Provide 25% spare space in pipe chases and for mechanical equipment (except air handlers).

Main Electrical Room: Locate main electrical room close to transformer and near the center of the load (which is usually located near where central mechanical equipment is located). Locate panelboards in satellite electrical rooms dedicated for electrical equipment and which stack vertically in the facility.

Spare Electrical Capacity: Provide 25% future space for additional overcurrent protection devices in panelboards and switchboards. Provide 25% additional load capacity in addition to the capacity required for continuous loads in panelboards and switchboards.

**Communication Rooms:** Locate communications rooms so they stack vertically and comply with TIA/EIA standards.

**Spare Communication System Capacities:** Provide 100% future space (this is not necessarily horizontal space, but may be vertical space in racks for future equipment) for cabling, data, and communications electronic equipment.

**Equipment Access:** In new facilities, provide access for replacement of equipment which does not require demolition.

**Storage Space:** Provide a minimum 6' X 6' space for storage of janitorial supplies or .2% of the gross square footage, whichever is greater.

## **3.2 CIVIL**

### **A. Paving**

#### **Design Requirements**

Use untreated base course under all curbs and gutters. Use untreated base course material under all sidewalks exterior flatwork and paved areas.

Untreated base course under asphalt paving: Asphalt - 8" minimum compacted base (96%)  
Concrete – curbs, gutters, sidewalks, exterior flatwork – Minimum 6" compacted base (96%) or minimum 4-3/4" crushed gravel.

Untreated Base Course	
Size	% by Weight Paving Sieve
1"	100
1/2"	70 to 100
#4	41 to 68
#16	21 to 41
#50	10 to 27
#200	4 to 13

Surface course (asphalt) aggregate:

Surface Course (asphalt)	
Size	% by Weight Paving Sieve
1/2"	100
3/8"	70 to 100
#4	50 to 78
#16	30 to 48
#50	18 to 31
#200	7 to 13



Base course (lower lift) can be ¾" asphalt if placed in more than 1 lift.

Construct asphalt paving only when atmospheric temperature is above 50 degree F and underlying base is from moisture. Permit no vehicular traffic for at least 24 hours after laying asphalt pavements.

Striping paint: State of Utah #780. Spread at the rate of 103-113 sf/gal. Minimum thickness shall be 7 dry mil.

Tack coat all adjoining materials, i.e. previously constructed asphalt, concrete, etc. except untreated base course.

Surface smoothness: variation in the finished surface must not exceed 1/8" in 10 ft. in any direction.

Asphalt shall comply with Marshall Design with voids 1.5% to 3.0%

Drainage: Slope all asphalt concrete paving surfaces for positive drainage a minimum of 1.5% and preferable 2%.

Minimum thickness for parking areas: 3". Minimum thickness for road areas and truck traffic is 3" including dumpster access.

Maximum thickness for lifts: 3"

### **3.3 ARCHITECTURAL**

#### **A. Suspended Ceiling Systems**

##### **Brief Description of the Problem**

In as much as the IBC requires that suspended ceiling comply with the requirements of section 9.6.2.6 of ASCE 7 for installation in high seismic areas, the code section has 3 requirements which have been problematic in application:

- 1) The width of the perimeter supporting closure angle must be not less than 2 inches and the grid must have a ¾" clearance from the wall. This requirement has created an aesthetic nightmare for architects and contractors since the 2" angle brings out all irregularities on the plane of the wall and requires increased inspection time to ensure a ¾" clearance.
- 2) Except where rigid braces are used to limit lateral deflection, sprinkler heads and other penetrations shall have a 2 inch oversize ring, sleeve, or adapter through the ceiling tile to allow for free movement of at least one inch in all horizontal directions. Alternately, a swing joint is permitted to accomplish the same movement. The issues with this requirement is that the Fire Marshall and the fire protection community will not approve

any oversize rings, sleeves or adapters which are not listed for this use and currently there are not listed systems on the market. The use of the swing joint is not defined in the code and no one has been able to establish how many joints are necessary to accomplish the horizontal movement of one inch in all directions.

- 3) Special inspection is required for suspended ceilings. This requirement is once again a problem since the ICC does not have a certification system for a ceiling inspector and we end up using a regular code inspector.

IBC section 104.11 allows the Building Official to approve alternate designs or methods of construction which he feels are equivalent or meet the intent of the current code. Uniform Building code Standard 25-2 for metal suspension systems for acoustical tile and for lay-in panel ceilings that can be found in the 1997 edition of the UBC is an equivalent standard that has been used in the codes for many years. This standard offers protection in all the seismic areas in the state and does eliminate all three of the issues identified above.

The State of Utah will allow the use of the 1997 UBC Standard 25-2 as an alternate means for the installation of suspended ceilings. This standard should remain available until all the issues identified above have been addressed by ICC and the listed materials are available in the market place. The designers may still use the current code requirements found in the 2003 IBC if they can show that they have met the intent of the current code.

## **B. Daylight and Outside Views**

### **Design Requirements**

Daylight and outside views are desirable for all occupied spaces. The needs of some occupied spaces may require special consideration for light control.

## **C. New Roofing Requirements**

### **Design Requirements**

Comply with Contractor Roofing Warranty: Include DFCM requirements. Refer to [http://dfcm.utah.gov/rphm/5yr\\_warranty.pdf](http://dfcm.utah.gov/rphm/5yr_warranty.pdf)

Comply with Guaranty for Bituminous Roofing: Include DFCM requirements. Refer to [http://dfcm.utah.gov/rphm/bur\\_warranty.pdf](http://dfcm.utah.gov/rphm/bur_warranty.pdf)

Comply with Guaranty for Single-Ply Roofing: Include DFCM requirements. Refer to [http://dfcm.utah.gov/rphm/singleply\\_warranty.pdf](http://dfcm.utah.gov/rphm/singleply_warranty.pdf)

Comply with the list of DFCM approved manufacturers and approved installers. Refer to <http://dfcm.utah.gov/rphm/manufacturers.pdf>

Where manufacturer's standards show one or more possible approach for compliance to the standard, provide their most stringent approach.

Eliminate conflict between roof penetrations (i.e. vents, exhausts) and roof crickets, flashing, and valleys. Consider relocating penetrations to less visible areas. Provide 18" access for replacing roofing components.

In new facilities, build slope into roof structure in lieu of built-up insulation to solve roof drainage issues.

Minimum slope for all roofing and waterproofing systems shall be a 1/4" per foot along the longest drainage path.

Do not provide the following components, unless approved by the Director:

Other Roofing Components: ballasted roofs.

All roofing systems and components should meet or exceed all ASTM, UL and FM requirements.

Minimum 60 mil thickness required for all single ply roofs.

Minimum 4-ply, type VI felts with type III asphalt for all built-up roofs.

All metal associated with the roof should be color clad, use standing seam joints where possible. Follow SMACNA guidelines for all metal work.

Provide reasonable access to all roof levels for maintenance personnel.

Steep slope roofing should be designed as directed by the DCM Program Manager.

Comply with all other minimum standards as published by the DFCM roofing group.

#### **D. Replacement Roofing Requirements**

##### **Design Requirements**

Comply with Design Requirements Record Roofing Requirements.

Existing Roof System Components: For existing roofs, evaluate the feasibility of using existing insulation, sheet metal and other existing roof system components if they are in like new condition and will not have a deleterious effect on the new roof system.

Roof Slope: Each existing facility project shall be evaluated to determine existing roof slope and if additional slope is required to eliminate ponding.

**Roof Diaphragm:** Evaluate the existing roof to determine whether the diaphragm needs to be upgraded to meet current seismic requirements. Report shall include: 1) Existing conditions related to current requirements; 2) Recommendations for upgrading the diaphragm relative to an upgrade of the facility; 3) Estimated costs for upgrading the diaphragm.

**Roof Load Evaluation:** Evaluate the existing roof deck structure to determine the existing dead and live load capacity. The weight of the entire roof system shall not exceed an amount that would reduce the live load capacity of the roof structure below the current requirements. Report shall include: The existing conditions relative to current requirements; 2) Recommendations for upgrading the load capacity, relative to an upgrade of the facility; 3) Estimated costs for upgrading the structure.

**Vapor Retarder:** Determine the need for vapor retarder based on dew point calculations, facility use, and existing facility and roofing system conditions.

## E. Waterproofing and Sealants

### Design Requirements

**Warranty:** For sealant systems, guarantee both labor and materials for a minimum of two years. For waterproofing project, guarantee both labor and materials for a minimum five years.

**Qualifications:** For Dampproofing and Waterproofing, select products that have performed successfully for a minimum 15 years and select manufacturers that have been producing materials for 15 years.

## F. Acoustical Quality

### Design Requirements

When possible, design spaces in accordance with following minimum requirements for “Privacy.”

Privacy	
Space Category	Measured NIC Rating
Confidential with high voice levels	58-60+
Confidential with slightly raised voice levels	52-58
Confidential with normal voice levels	50-52
Confidential with lowered voice levels	45-50

Design spaces in accordance with the following minimum requirements for “Ambient Background Noise.”

Ambient Background Noise	
Space Category	Measured NC Rating
Critical Performing Spaces	<20
Performing Spaces, Courtrooms, Executive Offices	20-30

Sleeping, testing, or relaxing spaces	25-35
Private offices, small conference rooms, classrooms, libraries	30 -35
Open offices, reception areas, cafeterias, gymnasiums	35-40
Lobbies, laboratories, maintenance shops	40 -45
Kitchens, industrial shops, equipment rooms	45-55

## **G. Guardrails**

Comply with code requirements for opening size but orient the members so that a ladder effect does not occur.

## **3.4 STRUCTURAL**

### **A. Concrete**

#### **Design Requirements**

Warranty: Provide additional two-year written guarantee commencing on the date of substantial completion to promptly remove and/or repair defective concrete (pitting, spalling, cracking, honeycombing, etc.).

Concrete Strengths & Testing: Provide minimum compressive strength measured at 28 days of 3000 psi for foundations, stem walls, piers, miscellaneous interior walls, etc., and 4000 psi minimum for all exterior flatwork, ramps, curbs, gutters catch basins, concrete pavements, interior floor slabs, elevated slabs, shear walls and columns. DFCM allows shear wall and columns to be specified in excess of 4000 psi. Specify pre-cast concrete with a minimum strength of 5000 psi.

Cement Types: Comply with the recommendations of the Geotechnical report. DFCM requires one of these types: Type I or Type II (both low alkali) and Type V. In southern Utah, usually select Type V. In other parts of the state select Type I or Type II (low alkali).

Concrete Mix: Provide low alkali cement for all concrete in direct contact with earth. Specify water/cement ratios in accordance with ACI 318. Specify number of bags of cement per/yard in accordance with C150. Provide admixtures complying with the requirements of ASTM C260 for air entrained concrete. Do not use "IA", "IIA", etc. For frost resistant concrete, the following minimum air contents are required for concrete in direct contact with soils or exposed to severe salting: for ¾" maximum aggregate size per C33, provide air content per ASTM C260 of 6-1/2%+ 1-1/2%; for 1", provide 6%+ 1-1/2%; for 1-1/2", provide 5-1/2"+1%. Water cement ratios shall be limited to 0.50. (excluding grout mixes) The slump of all concrete shall be limited to 4" unless plasticizers are used. A maximum of 10% fly ash is allowed.

Testing: DFCM shall pay for testing, unless other procedures are specified. The frequency and minimum numbers of test cylinders shall be as outlined in the IBC, however at least three test cylinders must be taken from each pour related to a structural member. The intent is to not to do

testing on concrete for items such as curb, gutter, sidewalk, mow strips, light pole bases, etc.

**Reinforcement:** Reinforce all concrete with conventional rebar or welded wire fabric. Slabs on grade supporting less than 400 psf uniform loads and no rack loads may be un-reinforced. The sub-base for all un-reinforced slabs must be uniformly compacted with on-site observation and per requirements specified in the project specifications.

### **3.5 MECHANICAL**

#### **A. Controllability of Systems**

##### **Design Requirements**

Maintaining space comfort temperature is an important consideration in the design of the mechanical system along with the proper ventilation within each space. This is accomplished best by the proper zoning of the space with regards to the mechanical system installed and the ability to control the temperature within each zone. The zoning for control of the space temperature shall be such that corner spaces having multiple exposures, office spaces for directors, managers, or other such individuals, and conference rooms larger than 200 square feet, shall have individual space control. Other multiple spaces shall be zoned with these spaces of like size, occupancy, and exposures are one zone and do not exceed more than four spaces per zone. Open spaces, such as open offices, shall not exceed one zone per every 750 square feet. Individual classroom spaces may be zone as a single zone even if the space exceeds 750 square feet with consideration for noise and air distribution (some large classroom spaces may need more than one zone for temperature control). Laboratory space zoning will be matched to the exhaust requirements for the labs and size of the laboratory space.

#### **B. Indoor Air Quality**

##### **Design Requirements**

Comply with ASHRAE 62.1-2004 and all approved addenda for Indoor Air Quality performance.

Comply with the carbon dioxide differentials for all types of occupancy are accordance with ASHRAE 62-2001, Appendix D.

#### **C. Plumbing General Requirements**

##### **Design Requirements**

**Insulation:** Completely insulate the following systems: all domestic cold water piping above ceiling; all domestic hot water piping and recirculation lines; roof drain and overflow piping including horizontal piping above ceilings, vertical piping below roof drain bowl, and roof drain

bowls. Provide protective covering for exposed insulation in areas subjected to damage.

Exterior piping insulation: Cover all insulation with aluminum jackets secured with aluminum bands 12 inches o.c. Seal joints watertight.

Main plumbing connections: Locate main water, and sewer connections and mechanical rooms on the same side of site as service, preferably close to maximum demand points such as core toilet stack, kitchens, boiler room, and fire protection systems.

Piping installation: Install piping overhead wherever possible. Avoid installing piping below or in concrete slab floors. Install piping on warm side of building insulation. Provide water-tight sleeve and caulking around pipe for all piping passing through floors.

Exposed pipe: comply with ASTM 53.

Underground pipe: comply with ASTM A106.

Roof drains: provide minimum 3 inch roof drains.

Equipment Pads: Provide minimum 4" high concrete bases for all pumps, air compressors, boilers, chillers, and other equipment.

Valves: Install valves with bonnets at least 45 degrees above the horizontal to ensure debris does not collect in bonnet.

## **D. Water System**

### **Design Requirements**

Municipal Water Meter: Each facility shall have a compound water meter installed in the water line serving the facility in accordance with local water authority.

Campus Water Meters. Install meter in the main mechanical room or within easy access of mechanical spaces. If conditions do not permit inside installation, provide meter box outside. Where fire sprinklers are installed, the fire main shall be connected ahead of the meter. Where outside meters are used, the meter box shall be 52" x 81" x 71" high with a concrete base under the meter, but the rest of the floor shall be gravel. Top shall have recessed eyes. Top to be poured separate so it can be moved off with a crane and the eyes shall be left large enough to insert a chain by which can be lifted. Cover to have a 24 inch locking meter lid in center. Position meter so it can be read without personnel entering the vault. Water meter indicator shall be the totalize type reading directly in gallons of water. Water meter shall be installed with valves on both sides so meter can be removed and a bypass line installed. Sleeve around pipes passing through walls of meter box.

Domestic Water Pressure shall be maintained at a reasonable operating pressure, i.e., 50 – 80 psig.

Valves: Provide valves near the main with a union for all branch lines of water which supply more than one outlet or unit so areas of the building may be shut down for repair without having to shut down large areas. Provide isolation valves as necessary and provide, as a minimum, valves for each toilet group outside of the toilet room, each floor, and each branch line that is 2" or greater. Provide a shutoff valve on all water supply lines on the room side of the fixture. Valves shall have a gasket seat, not a ground joint. Supply lines from the valve shall be 3/8" brass, chrome plated. Provide chases or access panels to access valves. In lieu of oversized globe valves, ball valves with full opening ports and adequate pressure and temperature rating may be provided up to two inches in size. For valves greater than two inches in size, butterfly valves with wheel and gear operator may be used.

Water relief valves: Connect water relief valve exhaust or discharge to nearby floor drain. Provide sump in pipe tunnels at each cleanout. Provide floor drains in toilet and utility rooms.

Faucets and hose bibs: Provide non-freeze type hose bibs with shut-off valves for the lines serving the hose bib located inside facility. Provide faucet with hose attachment and vacuum breaker in each restroom so floor can be washed with clean water. Provide hose bib with vacuum breaker in mechanical rooms and chiller rooms. Provide non-freeze hose bib with vacuum breaker near cooling tower. Provide hose bibs outside building for window washing, walk and area way washdown (generally not more than 150' on center).

Inaccessible Water Piping: Provide Duroon cast iron pipe, PVC "Blue Brute", or copper up to 2 inches in size, for water lines under building slab or other inaccessible locations.

Soil cover for outside services greater than 6000 HDD: Provide minimum cover of 48" or preferred cover of 60" for water. In no instance shall the minimum depth be less than the frost line.

Soil cover for outside services less than 6000 HDD: Provide minimum cover of 36" or preferred cover of 48" for water.

## **E. Waste System**

### **Design Requirements**

Pipe Tunnel Sumps: Provide sump in pipe tunnels at each cleanout. Sump shall be three foot square and four feet deep with grating cover and porous walls. Floor drains may be used in lieu of sump if depth of waste line is such that drains may be tied in.

Drains: Provide drains indirectly connected to building drainage system for walk-in refrigerators and other places where food is stored. Provide floor drains in toilet and utility rooms. Provide deep seal P-traps on all floor drains.

Equipment Room Floor Drains: Trenches with grating covers with bottoms sloped to drain are preferred over multi-floor drains in mechanical equipment rooms and some laboratories.



Water still drains: Provide Kimax glass to nearest main drain from water still drains or provide glass pipe for the first 20 feet horizontally or to the floor below. Provide cleanout at water still and at main drain line before glass is connected with soil piping

Waterproofing pans: Provide membrane ~~or lead~~ waterproofing pans for shower stalls and custodial floor sinks so they are 100% water tight. Provide clamping device which clamps drain to pans. Provide a mastic seal between floor drain bottom and lead or membrane so when clamping device is tightened there is a complete seal so no water can get through. Do not clog weep holes. Test pans by placing test plug in drain and filling with water overnight.

Dishwasher connections: Provide indirect connection for waste on automatic dishwashing machines. Install minimum 3" drain so that it is accessible under conveyor table.

Cleanouts: Provide cleanouts at base of each vertical rise, each turn in excess of 45 degrees ~~inches~~ and on straight runs every 50 feet.

Horizontal Waste lines: Provide dedicated minimum 3" horizontal waste lines with adequate cleanouts for garbage disposals and dishwashers.

Roof drains: Roof drain piping shall not be less than 3 inches.

Flush valves: Provide screwdriver stop valves on flush valves for water closets and urinals. Provide exposed type flush valves.

## **F. Plumbing Fixtures and Equipment**

### **Design Requirements**

Water Heaters: Coordinate installation so that nothing will interfere with the removal of water heaters or for heating coils in heat exchangers to allow for periodic cleaning. Provide unions for all connecting piping to facilitate the removal of piping. Provide combination temperature and pressure relief valve piped to adequate drain. Where feasible install flexible connections and tie-down straps to accommodate movement during seismic events.

Toilet Room Fixtures: Provide exposed type flush valves with lever operator (no push buttons or floor operators), diaphragm type only. In restrooms subject to vandalism, provide concealed flush valves. If space and budget allows, flush valves may be concealed in other applications. Hands free sensor actuated valves are acceptable, if acceptable by the Agency. Provide fixtures manufactured by one manufacturer.

Showers: Provide non-scald type shower valve with integral stops. Provide institutional type shower heads with flow adjustment and adjustable head and spray. Extend head out from wall so water does not run down wall when valve is turned off. Heads shall be vandal proof. Provide watertight shower escutcheon with weep hole in bottom.

Waterproofing pans: Provide membrane or lead waterproofing pans for shower stalls and custodial floor sinks so they are 100% water tight. Provide clamping device which clamps drain to pans. Provide a mastic seal between floor drain bottom and lead or membrane so when clamping device is tightened there is a complete seal so no water can get through. Do not clog weep holes. Test pans by placing test plug in drain and filling with water overnight.

Drinking Fountains: Provide refrigerated type, wall hung drinking fountains with stainless basins. Provide removable grid strainer to enable cable-style cleaning without having to dismantle the fountain.

**Do not specify the following components, unless approved by the Director:**

Toilet Room Fixtures: Tank type

## **G. HVAC General**

### **Design Requirements**

Heating systems: Hot water systems are the preferred heating systems. Provide air separators and expansion tanks for all hot water heating systems regardless of piping arrangement. Tie air separators into piping system on suction side of circulating pump. If campus system hot water system is turned off during the summer, provide alternate heating system for equipment requiring a heating source.

HVAC: Locate mechanical rooms to take advantage of ductwork and piping proximities to major loads. Provide continuous cooling for telecommunication and main telecommunication room. Carefully coordinate the location of any exhaust or relief air with mechanical air intake systems to avoid short cycling. Provide dedicated relief air path for all systems which introduce outside air. Exfiltration through the building envelope does not comply with this requirement.

Redundancy: Provide for continuous operation through redundancy and/or modularization for facilities greater than 30,000 sf or which have critical functions or critical care residents. The loss of one half or less of the design cooling or heating system for the entire facility shall be tolerated temporarily in the event of equipment failure for: heat pumps, boilers, refrigeration machinery (excluding cooling towers), and condensate pumps.

Access: Provide stair access to equipment. Provide disassembly access for all valves, piping, and equipment.

Water Treatment: Provide water treatment for heating water systems, chilled water systems, condenser water systems, and steam systems. Provide for one year on site service by water treatment company including supply of chemicals. Provide treated water in the heating system until facility is accepted by DFCM.

## H. Air Distribution

### Design Requirements

Filtration: Air handling equipment shall be fitted with filters in the medium efficiency category having an average efficiency of 25% to 35% based on MERV rating criteria. Specify that the Contractor replace all filters prior to building occupancy and provide one replacement set of filters for the entire facility. For air handlers exceeding 10,000 cfm, provide pressure differential instrumentation across the filter bank to facilitate maintenance.

Ductwork Materials: Provide rectangular and round ductwork from galvanized steel, stainless steel or aluminum. Leakage requirements shall meet or exceed SMACNA standards.

Volume Adjusting Devices: Provide devices that can be securely locking in place and that are accessible for adjustment after construction.

**Do not provide the following components, unless approved by the Director:**

Duct Lining: lining of outside air ducts, lining of ductwork within 10 feet downstream of any device that adds moisture to the air stream, line of ductwork exposed to humid air stream above 70% RH such as swimming pool applications.

Ductwork: Fiberboard ductwork.

## I. Piping System

### Design Requirements

Piping Systems: Piping system shall be provided with manual air vent valves at system high points and drain valves at system low points. Suitable provisions, such as access panels, shall be furnished in building construction to permit full access to these valves. Manual air vents shall be 3/8" globe valves with 1/4" copper tubing to near floor or to locations where water may be caught in bucket. Drain valves shall be threaded for 3/4" hose connections. Provide water-tight sleeve and caulking around pipe for all piping passing through floors.

Pumps: Provide pressure gauge with gauge cocks as close to pump suction and discharge as possible and avoid pressure drops across valves, strainer, flexible connectors, etc. Provide suitable throttling valves on discharge side of all pumps, such as globe valves, or balancing cocks. Throttling valve shall have set point position indicator and shall not be used for shut-off valve.

Exposed pipe: comply with ASTM 53.

Underground pipe: comply with ASTM A106.

Air Vents: Provide suitable air vents for all heat producing equipment (converters, unit heaters, coils, etc.).

Valves: Provide valves near the main with a union for all branch lines of water or steam which supply more than one outlet or unit so areas of the building may be shut down for repair without having to shut down large areas. For valves 2" and larger on systems greater than 200 degrees F shall be flanged or grooved.

## **J. Steam**

### **Design Requirements**

Motor Operated Steam Valve: If the existing central plant serving the campus is a steam system, provide a motor operated steam valve for each new building. Coordinate location with the Agency. If equipment requires steam when the valve may be closed, connect equipment ahead of motor operated steam valve. Design for gravity flow of condensate in lieu of providing vacuum pumps. Provide tunnels, chases, access doors, or crawl spaces for accessing steam piping. Do not install underground or in split tile. Provide properly dripped steam mains. Provide drip legs ahead of all steam pressure reducing valves and steam coils to ensure clean, dry steam at the valve.

Valves: Low pressure steam valves shall have a 200 psi rating and allow renewable seats and discs. For 100 psi steam line use 25 psi flanges and 300 psi screwed valves. Provide valves near the main with a union for all branch lines of steam which supply more than one outlet or unit so areas of the building may be shut down for repair without having to shut down large areas.

Steam piping: For steam piping 2" and smaller, provide schedule 80 black steel. For sizes 2-1/2" or larger, provide schedule 40 black steel for low pressure steam (15 psig or less) and schedule 80 black steel for high pressure steam (higher than 15 psig). Provide low pressure steam valves with a 200 psi rating and allow renewable seats and discs. Provide 250 psi flanges and 300 psi screwed valves for 100 psi steam lines.

Condensate piping: Provide schedule 80 black steel pipe, including underground return lines.

Underground steam lines: Provide Gilsulate, Ric-wil, Portage and Durrant insulated underground pipe for underground steam lines. If pre-insulated piping is used, provide separate insulated conduits for steam and condensate return piping.

Expansion Provisions: Provide expansion loops, swing joints, offsets, etc., for expansion of piping. Do not use expansion joints except when expansion loops, offsets, swing joints, etc., are possible due to space constraints. If expansion joints are provided, provide adequate internal or external guides that are properly supported anchored. Do not provide swing joints on main runs; however, swing joints may be installed on risers off the main.

Pressure reducing stations: Provide pilot-operated valve for pressure reducing stations. Provide a three-valve by-pass at all reducing stations with ample clearance to permit normal maintenance and inspection. Recommend parallel pressure reducing stations when low demand is expected. Provide safety relief valves on the low pressure side of regulator stations. Provide discharge

piping to facility exterior in a safe location. For pipes discharging near grade, install pipes into an eight inch concrete tie set upright in the ground (buried) over a gravel base twelve inches deep. Provide pressure gauges on both the high pressure and low pressure sides of all regulator stations. Locate gauges so they will function when bypass is used.

Steam Meter: Provide totalizing type meter which reads directly in pounds of steam.

Miscellaneous Requirements: Provide eccentric reducers when steam piping changes pipe sizes. Provide water-tight sleeve and caulking around pipe for all piping passing through floors.

## **K. Natural Gas**

### **Design Requirements**

Seismic gas shut off valve: Provide a seismic gas shut off valve installed per manufacturer's instructions for each natural gas system.

Natural Gas Piping: Weld all concealed natural gas piping if larger than 4". Where feasible install flexible connections and tie-down straps to accommodate movement during seismic events.

Soil cover for outside services greater than 6000 HDD: Provide minimum cover of 24" or preferred cover of 36" for gas.

Soil cover for outside services less than 6000 HDD: Provide minimum cover of 24" or preferred cover of 36" for gas.

## **L. HVAC Equipment**

### **Design Requirements**

Boilers: Provide boiler backup by redundancy or modularization. If a power burner is specified, the A/E shall determine the maximum allowable length of positive pressure flue.

Unit Heaters: If a unit heater is higher than 10' AFF, a centrifugal blower shall be provided and not a propeller fan. Provide all gas or oil unit heater with a 2-stage thermostat. On call for heat, the stage cycles the fan. The second stage fires the burner. For shop applications with heavy duty or corrosive atmospheres, provide sealed combustion units that bring combustion air from outside the space.

Water Chillers: Specify appropriate ARI Standards and certification.

Cooling Towers: Specify certification by the Cooling Technology Institute.

Converters: Provide side inlets and side outlets for all converters. Provide pressure gauges with snubbers on the primary and secondary side of each converter. Install thermometers on the inlet and outlet of the secondary side of each converter.

**Do not provide the following components, unless approved by the Director:**

HVAC Equipment: electric resistance heat, furnaces.

## **M. Integrated Automation**

### **Design Requirements**

Direct Digital Control: Provide direct digital control in all facilities, except where operations personnel require pneumatic control as an extension of an existing system. Provide digital metering of electrical, hot water, steam, and chilled water sources to each facility. Provide flow metering devices hot water heating systems. Provide straightforward DDC control systems. Avoid locating thermostats on outside walls or on partitions between offices. For perimeter radiant systems, provide Hydronic piping subcircuits to match the cooling zones.

Control valves: Provide visual position indicators. Provide control valves with stem in the vertical position. If possible, provide packless valves. Do not provide “self-contained” valves.

Dampers: Provide low leakage design of felt or neoprene edges for fresh air and exhaust air dampers. Provide opposed blade type modulating dampers with maximum blade width of eight inches. Provide fresh air dampers that close in fan shutdown or power failure. Provide steel trunnions mounted in bronze sleeve bearing or ball bearings for damper blades. Do not exceed 48 inches in length between damper bearings. Provide dampers that close substantially tight and provide substantially the full area of the opening when open. Provide substantial bar or channel frames for dampers. For rectangular dampers larger than four square feet in area, provide additional corner bracing.

Thermostats: If system supports DDC monitoring, provide solid state thermostats. Thermostats in corridors, halls, restrooms and other similar unsupervised areas shall be flush mounted aspirating type with stainless steel cover. Thermostats in public, but supervised areas shall have locking covers with concealed adjustment. Thermostats in private offices may have exposed adjustments.

Panels: Provide control devices, relays, piping, wiring and terminals in cabinets, except that switches, pilot lights, and push buttons mounted on the door. Provide minimum 14 gauge steel or 12 gauge aluminum. Equip doors with hinges, latches, and locks. Secure panels to walls, columns or floors with clearances required by NEC. Provide two (2) keys for each panel.

Wall Mounted Control Diagrams: Provide plastic laminated copies of all applicable controls diagrams mounted on the wall in each equipment room.

**Control wiring:** Provide control wiring in raceway complying with the requirements of DIV 16, except that ½" C may be installed for control wiring of less than 50 volts which complies with NEC conduit fill requirements.

## **N. Automatic Sprinkler Systems**

### **Design Requirements**

Provide an automatic sprinkler system in buildings when required by the building codes adopted by the State of Utah.

It is desirable that all buildings constructed by the State of Utah be equipped with an automatic sprinkler system to provide added life safety for the occupants and to protect the building from fire loss.

Fire sprinklers shall be considered as an integral component of building design when the availability of water supply and the cost do not make the installation prohibitive.

Secondary structures and small buildings or buildings with low occupant loads may be excluded from this requirement with the approval of the Director.

## **3.6 ELECTRICAL**

### **A. Emergency Electrical Requirements**

#### **Design Requirements**

Modify paragraph 700.12 General Requirements of the NEC to:

“Current supply shall be such that, in the event of failure of the normal supply to, or within, the building or group of buildings concerned, emergency lighting, emergency power, or both shall be available within the time required for the application but not to exceed 10 seconds. The supply system for emergency purposes for buildings totaling less than 5000 sf, in addition to the normal services to the building and meeting the general requirements of this section, shall be one or more of the types of systems described in 700.12 (A) through 700.12 (E). Unit equipment in accordance with 700.12(F) shall satisfy the applicable requirements of this article for buildings totaling less than 5000 sf. The supply system for emergency purposes for buildings totaling 5000 sf or greater, in addition to the normal services to the building and meeting the general requirements of this section, shall be the type of system described by 700.12 (B). This requirement shall not prohibit the use of the supply systems 700.12 (A), or 700.12 (C) through (F), for buildings totaling 5000 sf or greater, if these systems are required for safety purposes and if these systems are automatically connected to a Generator Set as described in 700.12 (B).” [The balance of section 700 is unchanged.]

Modify paragraph 701.11 Legally Required Standby Systems of the NEC to:

“Current supply shall be such that, in the event of failure of the normal supply to, or within, the building or group of buildings concerned, legally required standby power will be available within the time required for the application but not to exceed 20 seconds. The supply system for legally required standby purposes for buildings totaling less than 5000 sf, in addition to the normal services to the building shall be permitted to comprise one or more of the types of systems described in 701.11(A) through 701.11 (F). Unit equipment in accordance with 701.11(G) shall satisfy the applicable requirements of this article for buildings totaling less than 5000 sf. The supply system for legally required standby purposes for buildings totaling 5000 sf or greater, in addition to the normal services to the building shall be required to be the type of system described by 701.11 (B). This requirement shall not prohibit the use of the supply systems 701.11 (A), or 701.11 (C) through (G), for buildings totaling 5000 sf or greater if these systems are required for safety purposes and if these systems are automatically connected to a Generator Set as described in 701.11 (B).” [The balance of this section is unchanged.]

The Director of DFCM may authorize battery packs in suitable applications when the standard is not achievable due to the unique circumstances of a particular project or the constraints of the project budget.

## **B. Lighting**

### **Design Requirements**

Occupants within an enclosed space shall have the capability to adjust the lighting within the enclosed space.

Light Pollution Reduction: Comply with Light Pollution Reduction requirements, unless otherwise directed by the DFCM’s Designated Representative.

Comply with the Illuminating Engineering Society of North America (IESNA) Recommended Practice Manual: “Lighting for Exterior Environments (RP-33-99).” Provide exterior luminaires which are shielded. For luminaires with more than 3000 initial lamp lumens, provide Full Cutoff (IESNA Classification) luminaires. Interior lighting shall be positioned so that the maximum candela value does not fall outside the interior space, such as out through a window. Exterior lighting shall be located so that the maximum candela value of all exterior lighting shall fall within the property. Provide shielding for any luminaire within a distance of 2.25 times its mounting height from the property boundary so that no light from the luminaire illuminates past the property boundary.

Lighting Fixtures. Provide lenses that will not yellow due to exposure to sunlight or to the light sources in the fixture. When acrylic diffusers are specified, provide 100% virgin acrylic. Provide electronic ballasts, except that magnetic ballasts may be used in outdoor applications. Provide program start ballasts, if available for the lamp type. Connect equipment grounding conductor to fixture housing. Provide a 10% spare lamps, diffusers or glass for each light fixture type with not less than one for less than 10.



**Interior Lighting:** Provide T-8 lamps in fixtures, except for areas requiring special lighting. Provide independent safety-wires attached to structure at two diagonal corners of lighting fixtures in compliance with seismic requirements. For recessed fluorescent fixtures that are removable, locate outlet box with 3' of steel flexible conduit to the fixture to aid in removing and relocating fixture.

**Exterior Lighting:** Provide -10 degree F. ballasts, either constant wattage or pulse start. Provide break-away fuse for all phase conductors for all outside pole mounted lighting fixtures. Provide a shorting fuse insert for neutral fuse holder. Do not use common neutral multi-wire circuits for this type of lighting.

**Reflected Ceiling Plan Coordination:** Coordinate the lighting fixture with the reflected ceiling plan for lay-in and surface mounted fixtures. Recessed lighting fixtures in acoustical tile ceiling shall be located centered on a single tile or at the intersection of four tiles.

**Lighting Fixture Supports:** Provide swivel bases for stems supporting lighting fixture which exceed 12" in length.

**HID Sources:** Provide Constant Wattage ballasts. For metal halide, provide Pulse Start Metal Halide lamps and ballasts. For indoor, provide pulse start electronic ballasts. For outdoor up to 200 watts, provide pulse start electronic ballasts. For outdoor above 200 watts, provide magnetic ballasts if control, noise, and flicker requirements are satisfied.

### **C. Raceways to 600 V**

#### **Design Requirements**

**Raceways, Fittings, and Boxes.** Provide steel raceway, fitting, and box system for all wiring, except that plastic conduit (minimum schedule 40) may be installed underground and aluminum cable trays may be installed for communications cabling. For steel raceway installed in contact with soil, provide rigid or IMC PVC coated or wrapped raceways, fittings, etc. Provide steel raceways for penetrating structural elements (minimum 10' each side) and rigid steel conduit (PVC coated or wrapped) for bends greater than 22 degrees. Provide minimum 3/4" raceways, except 1/2" may be provided for HVAC Instrumentation and Control. For Communications raceway, the bend must be a minimum 6 times the diameter for sizes 2" or less and 10 times the diameter for larger than 2". Provide flexible steel conduit (minimum 1/2") in short lengths where movement, vibration, misalignment or cramped quarters exist. Provide insulated throat or equal type plastic bushings for box connection 1" or larger. Provide double lock nuts and plastic bushings for IMC and rigid conduit. Provide liquid-tight flexible conduit with approved moisture-tight fittings for wet, humid, corrosive or oily locations. Provide a minimum 18" liquid-tight flexible conduit at each motor. Provide minimum 4/s box 1-1/2" deep with plaster rings, except provide 3-1/2" deep masonry boxes for masonry. For boxes with 3 or more raceway entrances, provide minimum 2-1/8" box. For boxes with 4 or more raceway entrances, provide 4-11/16" boxes (except for masonry boxes). Provide gang boxes for multiple gang installations. Provide accessible junction boxes in interior raceway runs at minimum 100 foot intervals. Provide minimum 12" clearance from hot water and steam lines measured from outside of

insulation.

Electrical Supports. All raceways, boxes, and conductors shall be supported independently from all other electrical or mechanical systems, directly from building structure by a listed supporting device. Provide bracing parallel to trusses, beams, joist, bridging, etc. Provide anchors capable of supporting 4 times the weight of the unit supported, but not less than 100 lbs. For ceiling fixture outlet boxes, provide minimum supporting capacity of 200 lbs and a standard 3/8" stud. Provide outlet boxes with rigid support using metal bar hangers between studs. Provide concrete pads 6 inches beyond the largest dimension of the equipment. Extend equipment pad a minimum of 4" above finished floor or grade.

Steel Raceway Supports. Provide minimum of 2 supports per ten foot length; Support within 12 inches of bends, couplings, fittings and boxes, minimum of two straps per ten foot length. For 2 runs or less of 3/4" to 1-1/4" raceways, provide supports with full straps, clamps or hangers. For individual run 1-1/2" or larger raceways, provide supports with hangers. All other raceways, support with trapeze mounting channels.

Future Raceways: Provide five capped spare 3/4" conduits from each section of a branch panelboard into the ceiling and floor space. If the floor space is not accessible, provide an additional 3/4" conduit from each section of a branch panelboard into the ceiling. Provide 200-lb nylon pull cord in all empty conduit, then cap raceway using a blank cover similar to adjacent wiring device covers.

Underground Raceway Identification and Installation: Provide direct buried conduit in an area outside a building not less 24" deep, with magnetic "yellow warning" ribbon 12" directly above and 6" below finished grade measured from the top of the conduit or duct bank.

**Do not provide the following, unless approved by the Director:**

Exposed cable wiring.

Other raceway systems: Electrical Non-metallic Tubing, aluminum conduit, die cast fittings, steel cable trays.

## **D. Conductors**

### **Design Requirements**

Conductors. Provide minimum #12 copper conductors with 600 V insulation (THW, THWN, THWN-2, XHHW, or XHHW-2) for all phase conductors; unless ambient conditions require an increased insulation rating. Do not parallel less than #1/0 conductors. Do not feed conductors through one section of panelboard to connect to an overcurrent device in another section of panelboard. Provide separate neutrals for all GFI circuit breakers and for the load side of feed thru GFCI outlets. Provide minimum 12" clearance from hotwater and steam lines measured from outside of insulation.

Do not provide the following, unless approved by the Director:

Exposed cable wiring.

Splices in panelboard, switchboard enclosures, or in conduit bodies.

Other cabling methods: Non-metallic sheathed cables (Romex), Metal Clad Cables, aluminum conductors.

## **E. Grounding**

### **Design Requirements**

Grounding. Ground all medium voltage equipment and exposed metals in the immediate area with the neutral conductor of the primary cable and with a minimum 5/8" X 10' ground rod. Provide grounding electrode system at the service entrance with, at a minimum, two of the following electrodes as defined in the NEC: metal underground water pipe, concrete-encased electrode, or ground ring. In addition, bond to other available electrodes. Provide a separate green grounding conductor enclosed with phase conductors in all raceways on the load side of the service entrance. Provide grounding bushings for all service raceways and for raceways installed in concentric/eccentric knockouts. All grounding systems shall be interconnected and/or bonded to the grounding electrode system. Upgrade as necessary existing electrical systems to comply with the NEC and these requirements.

## **F. Medium Voltage**

### **Design Requirements**

Medium Voltage Conductors: Provide copper conductors with copper tape shields and EPR insulation and 100% copper neutral in Medium Voltage Ductbanks; or, in utility tunnels or other areas without public access, provide armored cable or rigid conduit. Comply, as a minimum, to the installation requirements for Medium-Voltage Cable standard NECA 600-2003. Perform Hi-Pot test after terminations have been made, but before connections have been made to buses or apparatus. Perform continuity tests of all cables after entire installation and terminations have been completed. If a cable fails to perform, replace faulty cable and retest. All tests will be recorded and submitted with M & O manuals at project conclusion.

Medium Voltage Duct Banks. For interior of buildings in non-public areas, provide rigid galvanized conduit or armored cable marked with red HIGH VOLTAGE. For exterior applications or public areas, provide concrete encased duct-banks (red dye) with raceways in multiples of two and a minimum of one spare conduit (with polypropylene pull wire) per feeder. Provide rigid metal conduit for the first 10 feet of duct bank from a facility or manhole. Provide minimum 4" raceway.

Medium Voltage Transformer: A/E shall design harmonic mitigation to reduce current total harmonic distortion (based upon full load capacity of the transformer) below 5%. Provide copper or aluminum windings. Provide transformer taps and adjust voltage output to obtain the proper value. Provide primary and secondary terminations at medium voltage transformers, cable, splices, etc. necessary to complete installation. Do not use Askarel transformers.

Lightning Protection: Provide lightning (surge) arresters for medium voltage transformers and switchgear located above ground outside.

## **G. Controller**

### **Design Requirements**

Motor controllers: Provide NEMA rated magnetic motor controllers with thermal overload relays for each phase. Provide auxiliary contacts, HOA switches or start-stop pushbuttons as appropriate, stop and run pilot lights, and reset pushbuttons. Provide fused control transformer in the starter for 120 V control. Provide safety interlock to prevent opening enclosure with equipment or control energized.

Variable Frequency Controllers: Provide PWM variable frequency controllers suitable for the application, factory pre-wired with integral disconnect, input filter, and integral ventilation. Coordinate approved manufacturers with the Agency. Provide interface to HVAC or Building Automation System for control. For interior VFCs, size ventilation for ambient temperature of 32 degrees F. to 90 degrees F. Avoid exterior mounted VFCs; but, if required, provide ventilation for ambient temperatures from -30 degrees F. to 120 degrees F. Fault current rating shall be sized based upon the fault current analysis of the nearest upstream overcurrent device. Include factory startup and tune to optimize life of motor. Provide VFCs which operate within the following normal ranges of inputs: +/- 10% input voltage; +/- 5% input frequency; less than 7% voltage THD. Provide VFCs which operate through voltage sags of 0% voltage for 1 cycle and 60% voltage for 10 cycles. For Motors 7.5 hp and larger, provide a minimum power quality performance of 12% current THD and 3% voltage THD at filter or VFC input by providing a broadband type filter or minimum 12 pulse VFC complying with the power quality performance requirements demonstrated by standard factory published data. For Motors less than 7.5 hp, provide AC Line Reactor or DC Link Reactor. For VFC output filtering, provide output filter if drive output at motor termination exceeds pulse-withstand capability. Provide 95% efficiency minimum including filter and 95% power factor. Provide local speed control, HOA switch, remote start/stop, external safeties, run annunciation, fault annunciation, and speed reference input connection. For maintenance purposes, provide stable operation including starting, stopping and running with the motor completely disconnected; provide auto restart after a power failure; provide capability for starting into a rotating motor at any speed.

Provide a manual bypass of UFC as part of controller.

Do not provide the following components, unless approved by the Director.

Other Electrical Components: IEC motor controllers.

## H. Electrical Distribution

### Design Requirements

Overcurrent and Ground Fault Protection: Set overcurrent and ground fault protection based upon Fault Current Protection and Coordination Study prepared by the A/E.

Submit study with M & O manuals.

Transformers: Provide transformers with copper conductors. Provide transformer taps of 4 taps – 2.5% above normal and 2 taps – 2.5% below normal. Adjust voltage output to obtain the proper value at the main disconnect.

Metering: Provide secondary digital metering (including demand monitoring) at the main distribution panel(s) in each facility. For secondary digital metering for facilities greater than 800 Amps include harmonic monitoring and an option for building automation monitoring or other remote monitoring. Indicate multiplying factor on meter face where current transformers are used.

Utility Metering: Comply with serving utility's regulations, if applicable. Comply with utility's metering requirements. Include cost assessed by serving utility.

Switchboards and Panelboards: Provide bus hardware installed on the bus for future over-current devices of not less than 25% minimum. Provide over-current devices in the same sequence as shown on the panel schedules or one-line diagrams. Coordinate that the height of the operating handle of the over-current device does not exceed 6'6" above the floor. Identify main over-current protection devices.

Panelboards: Provide listed panelboard construction for all branch panels and circuit breaker distribution panels. For 3 phase 4 wire delta systems, connect Hi-Leg to center bus. Provide ground bus bonded to enclosure to terminate all equipment ground conductors. Include insulated ground bus for insulated ground circuits. Key all panelboards alike and provide 3 keys.

Circuit Breakers: Provide one, two or three-pole over-current devices with common handle (not field modifiable). Provide bolted connections.

Do not use the following components, unless approved by the Director:

Other Electrical Components: load centers, plug-in circuit breakers.

## I. Miscellaneous Electrical

### Design Requirements

Lighting Contactors: Provide NEMA rated lighting contactors with HOA.

Wiring Devices: Locate switches so as not to exceed 48" to the bottom above finished floor. Except for floor boxes, locate convenience outlets so that outlet is not less than 18" to the bottom and not greater than 48" to the top above finished floor. Coordinate heights with cabinetry and finishes. Use feed through GFCI outlets only if the outlet served is located in the same room. Convenience outlets (120 V) and switches (120/277V) shall be minimum 20A self-grounding with nylon faces and cover plates. Coordinate device colors and plates with the finishes. Provide industrial raised covers for surface switches and outlets. Arrange devices in gangs if multiple devices are located at the same location. Provide mounting strips and blank cover-plates for outlet boxes without devices. Do not connect more than eight (8) convenience outlets on each 20A circuit.

Lightning Protection: If the risk analysis performed per NFPA 780 exceeds moderate risk, provide a lightning protection system. Minimum qualifications required: LPI-certified installer, designer, and inspector. Obtain a UL Master Label for the facility.

**Power Quality:**

A/E shall include in the Basis of Design an evaluation of the potential harmonic risks to the electrical distribution system and the approach to mitigate the risks to transformers, neutral conductors, and other equipment.

Design TVSS for the main service of each facility with services greater than 200 A. Include a second level of TVSS for panelboards serving primarily computer or other electronic equipment.

Specify harmonic testing of each transformer (voltage and current THD) after the facility is occupied to determine effectiveness of the Power Quality approach.

Hazardous Classifications: Coordinate with Fire Marshall hazardous classifications and requirements, including class, division, and group requirements.

Generator Fuel Tank Size: Size fuel tank to comply with Code requirements and facility needs. Allowance shall be made in the capacity so that there is adequate fuel to comply with these requirements when the tank indicates that it needs to be refilled. Provide a minimum tank capacity for 24 hour continuous operation.

**J. Structured Cabling**

**Design Requirements**

Test all structured cabling systems to demonstrate compliance with TIA/EIA standards for the category of system selected. Include warranty and the test results in the Project Resource Manual.

## K. Fire Alarm

### Design Requirements

Provide addressable fire alarm systems. Install class “A” looped systems or as approved by Fire Marshal.

**Do not use the following components, unless approved by the Director.**

Other Fire Alarm Components: Zoned Fire Alarm panels, ionization smoke detectors.

## L. Misc. Systems

Determine requirements for other systems such as security, cctv, etc.

## **3.7 LANDSCAPING**

### A. Irrigation Water

#### Design Requirements

Reduce life cycle costs by requiring the A/E to design state-owned buildings to comply with the following:

Water Allowance for Landscape Irrigation		
Type	Facility Type	Water Allowance
A	Office Buildings	.5
B	Existing campus/institution	.7
C	New campus/institution	.6
D	Recreation areas (ball fields, etc.)	.7
E	State Parks (natural areas)	.1

The annual Landscape Water Allowance shall be calculated using the following equation: Landscape Water Allowance (gal) = ET x PF x (Area/IE) X.62. Where Landscape Water Allowance is in gallons per growing season; ET = Reference Evapotranspiration in inches per growing season; PF = Plant Factor (see chart below); Area = total Irrigated Landscape Area in square feet; IE = irrigation efficiency (see chart below); .62 = conversion to gallons.

Plant Factor (PF)		
Plant Type	Plant Hydrazone	Plant Factor (PF)
Turf	3+	1.0
Non-drought tolerant trees, shrubs and ground cover	2-3	.7

Water-conserving trees, shrubs and ground cover	1-2	.5
Extra drought-tolerant trees, shrubs and ground cover	0-1	.2
Mulch areas not irrigated	0	0

Irrigation Efficiency	
Irrigation Type	Irrigation Efficiency
Bubblers	.85
Drip Emitters	.85
Stream Sprinklers in planter strips 8 feet or wider	.75
Spray Sprinklers in planter strips 8 feet or wider	.625
Spray Sprinklers in planter strips less than 8 feet wide	.4

All splices below grade are to be approved for wet locations.

Comply with the "Minimum Standards for Efficient Landscape Irrigation System Design and Installation", Current version of the Utah Irrigation Association. Refer to [www.utahia.org](http://www.utahia.org)

## **B. Plant and Soil**

### **Design Requirements**

Comply with the following:

Top Soil Quality Guidelines for Landscaping, refer to [www.usu.edu/files/agpubs/topsoil.htm](http://www.usu.edu/files/agpubs/topsoil.htm)

USDA Hardiness Zones, refer to <http://www.usna.usda.gov/Hardzone/index.html>

TPI's "Specifications for turf grass sod materials" and "Specification for Turf grass sod transplanting" and installation in its "guideline specifications to turf grass sodding"

Utah Water-Wise Plants, refer to <http://extension.usu.edu/files/gardbids/hg500.pdf>,

<http://extension.usu.edu/files/gardbids/hg500-2.pdf>,

<http://extension.usu.edu/files/gardbids/hg500-3.pdf>

**Do not use the following components, unless approved by the Director.**

Other Plant Materials: Plant materials not complying with the Utah Water-Wise Plants and complying with USDA Hardiness Zones.